IPEMOTION

IPEmotion

User manual

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2 General information

2.1 About this manual

The manual *IPEmotion* describes the structure of the software and how to use the features for configuring devices, acquire data, manage, manipulate and analyze the acquired data.

Please read the manual *IPEmotion* carefully to get to know the software and learn more about the functions and special features of *IPEmotion* before using the product. This manual also contains information for installing and removing the software.

The main navigation point *Info* allows you an easy and quick access to the IPEmotion software .

While working with IPEmotion, you can reference to this manual at any time via the and buttons.

2.2 Version

2.2.1 Manual IPEmotion

This manual has the version number 02.00.

2.2.2 IPEmotion

The descriptions in this documentation refer to the current release of IPEmotion with the version number 02.00.

2.3 Legend of the used icons

	Tip	*This icon indicates a useful tip that facilitates the application of the software.*
	Information	*This icon indicates additional information for a better understanding.*
	Attention!	*This icon indicates important information to avoid potential error messages.*

2.4 Support

Headquarter:

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Management: Erich Rudolf, Andreas Wocke

Technical support and product information

You are a customer with an IPEmotion service contract:

- Please find the free hotline number in your valid service contract.

You are a customer without an IPEmotion service contract:

- Send us your inquiry to support@ipemotion.com.

2.5 Product licensing

IPEmotion is a copy-protected software. It uses a copy protection in the form of a license key.

To be able to use IPEmotion, you need a valid license key. If no valid license key is available, please contact IPETRONIK GmbH & Co. KG to purchase a license.

2.6 Related documentations

2.6.1 IPEmotion COM

The documentation IPEmotionCOM.chm provides you with a description and useful information related to the COM interface in IPEmotion. This documentation is stored in the following standard directory: C:\Programs\IPETRONIK\IPEmotion Vxx.xx.xx\Help.

2.6.2 Hardware

The documentation for each installed plugin is stored in the respective program folder. This documentation is created by each producer on one's own responsibility.

2.7 Documentation feedback

At IPETRONIK, the technical publications team strives to produce documentations of the highest quality and values your feedback as a reader and user. If you have any comments or suggestions regarding our product manuals, contact us under support@ipemotion.com.

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- Version number (Select *About* from the menu to display the version number.)
- Name of the guide
- Page number or section title
- Brief description of the content (e.g. inaccurate instructions, grammatical errors, or information that require clarification)
- Any suggestions for a general documentation improvement

3 Introduction

To get started, please read this document carefully to get to know the functions and special features of IPEmotion.

In addition to acquiring data from hardware modules using IPEmotion, you can initialize, program, and configure various hardware measuring modules.

IPEmotion is software for configuring, displaying, measuring and storing acquisition data.

After acquiring and storing data using IPEmotion, you can manipulate, analyze, and generate reports for documentation purposes on the basis of the recorded data.

For more information about the functionality and the known restrictions please consult the Release Notes of your IPEmotion software.

We are looking forward to your feedback at: support@ipemotion.com.

3.1 IPEmotion editions

IPEmotion is available in different editions. The following chapter shows an overview with information about all editions and their functionality. You can find out which edition meets your requirements and fits your needs the most. You can select between the following editions of IPEmotion:

- Demo 30 days
- Basic
- Standard
- Professional
- Developer

Function:	Demo 30 days	Basic	Standard	Professional	Developer
Multilingual user interface + Help	✓	✓	✓	✓	✓
Predefined skins for day / night visibility	✓	✓	✓	✓	✓
Integrated user guidance for system configuration	✓	✓	✓	✓	✓
Project settings for data managing using XML	✓	✓	✓	✓	✓
Automatic device detection + configuration	✓	✓	✓	✓	✓
Integration of manufacturer specific data sources /	✓	✓	✓	✓	✓

sinks (3rd party hardware)					
Exact time synchrony for all used interfaces and devices at data storing	✓	✓	✓	✓	✓
Channel based signal acquisition (with trigger + storage groups)	✓	max. 10 signals, max. 1 storage group	max. 256 signals, max. 2 storage groups	✓	✓
Direct storing of data in different data formats	✓	(IAD, DAT, CSV)	(IAD, DAT, CSV, Excel 2003 XML)	✓	✓
Online visualization of data in the grid (All Channel View)	✓	✓	✓	✓	✓
Online visualization of data with diagrams and instruments	✓	max. 10 signals, max. 1 page	max. 256 signals, max. 5 pages	✓	✓
Customizing visualization/scaling during a running acquisition	✓	✓	✓	✓	✓
Wide channel based calculation functionality	✓	✓	✓	✓	✓
Analysis (Load and validate data)	✓	max. 10 signals	max. 256 signals	✓	✓
View and correct channels during a running acquisition in the same SW user interface	✓	✓	✓	✓	✓
Integrated creation of support files for quick assistance	✓	✓	✓	✓	✓
Scaling calculator with graphical assistance	✓	✓	✓	✓	✓
Import description files for configuring (DBC, A2L, etc.)	✓	✓	✓	✓	✓
Load data with other formats (Import)	✓	✗	(only DAT)	✓	✓
Import signal database (MPC format)	✓	✗	✗	✓	✓
Automating sequences	✓	✗	✗	✓	✓
Creation of runtime	✗	✗	✗	✗	✓

versions					
Service contract obligation	✗	✗	✗	✓	✓

4 Setting up and removing

4.1 System requirements

The minimum hardware and software requirements for the application of IPEmotion are outlined below:

4.1.1 Hardware

- PC with 1 GHz Pentium processor,
- 1 GB RAM,
- Hard disk with a minimum of 100 MB free disk space,
- Graphics card with VGA screen and a resolution of minimum 1.024 x 768,
- USB port for the installation from the USB flash drive,
- CD-ROM drive for the installation from the product CD.

4.1.2 Platforms

The software IPEmotion can be run under the following operating system:

- Windows XP (Service Pack 2 or higher, 32 Bit only),
- Windows Vista (32 Bit and 64 Bit),
- Windows 7 (32 Bit and 64 Bit).

4.1.3 Software

The following software will be installed:

- Microsoft .NET 3.5 Framework incl. Language packages German and French,
- Microsoft MSXML 4.0,
- Microsoft Visual C++ 2005 Redistributable.

4.2 Installing IPEmotion

The following chapter guides you through the installation process of IPEmotion.

IPEmotion needs administrator rights during the installation. Working with IPEmotion requires that you need at least limited user's or default user's rights (Vista).

For running IPEmotion without administrator rights and with Windows 7 contact your system administrator. Please find basic information about configuring the User Account Control in the following links: http://en.wikipedia.org/wiki/User_Account_Control, http://technet.microsoft.com/en-us/library/dd835546(WS.10).aspx.

The installation of IPEmotion is based on an installation wizard that guides you through the setup process step by step. You can start the installation wizard from the USB flash drive, the product CD or, if you have downloaded the setup program, from the setup file itself.

To install the IPEmotion software:

1. Start the installation wizard from the USB flash drive, the product CD or from the setup file.

- *USB flash drive:* Connect the USB flash drive to the USB port of your computer and follow the instructions of the installation wizard.
- *Product CD*: Launch the product CD and click I**nstall Software** on the Welcome screen. On the **Install Software** screen, click **Install IPEmotion** to start the installation wizard.
- *Setup file*: Browse the location of the setup file and double-click **IPEmotion.exe** to start the installation wizard.

*Depending on the PC operating system, a security warning appears. Click **Run** to start the installation wizard.*

2. Setup language/Setup-Sprache/Langue d'installation: Select the language for the installation process. You can choose between the languages German (Germany), English (United States) and French (France).

Setup language/Setup-Sprache/Langue d'installation
Select your language for this installation. Wählen Sie die Sprache dieser Installation. Choisissez la langue d'installation.
English (United States)
OK
Cancel

Click **OK** to start the IPEmotion installation wizard.

3. Welcome screen: This is the first screen in the IPEmotion installation wizard.

Click **Next** to continue.

4. License agreement: Read the license agreement carefully and accept the included conditions.

Click **Next** to continue.

5. Customer information:

Please enter your customer information. Click **Next** to continue.

6. Hardware system: Select the desired hardware system or deactivate the hardware not to be used.

Click **Next** to continue.

7. Setup type: Choose the desired type of installation.

With the standard installation, you can select between the standard installation for the logged in user and a standard installation for all users.

If you select the **Standard installation** skip the following point *Destination folder*. Click **Next** to continue with point 8.

If you select **Custom** you can choose user-specific settings according to the destination folders. Click **Next** to display the following dialog.

Destination folder:

Due to the security model of Microsoft Corporation related to .NET applications, the installation of IPEmotion on a local drive is recommended.

According to the Microsoft conformance guidelines for Windows applications the IPEmotion files are installed to the default locations that are specific to the operating system and language.

Accept the default installation location for IPEmotion, the application data, and the user data. To select another location click **Change**.

After you have specified the location for the IPEmotion installation, click **OK** to return to the **Destination folder** screen.

Click **Next** to continue.

8. Ready to install the program: This screen indicates that IPEmotion is ready to install.

Click **Install** to start the installation.

9. Installing IPEmotion: A progress bar is shown during the installation process.

10. Installing hardware system(s): Follow the instructions of the installation wizard to install the selected hardware systems.

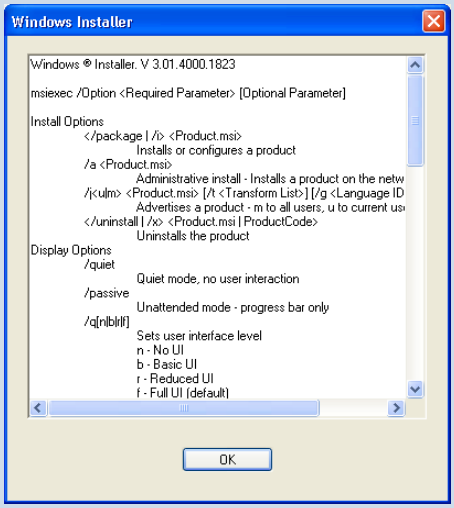
11. InstallShiel Wizard Completed: After the successful installation, the following screen is shown.

Click **Finish** to exit the installation wizard.

IPEmotion is now shown as an **icon** on your desktop as well as in the menu **Start** → **Programs** → **IPETRONIK** → **IPEmotion**.

Due to the fact that the IPEmotion installation file is a exe standard setup file, user-specific parameter configurations can be made with a silent installation*, e.g. options for installation, indication, repair.*

With the entry of the command msiexec *the following screen appears where the possible administrative installing options are listed.*



For the silent installation of IPEmotion, call Setup IPEmotion.exe with /S /v/qn parameters. A Windows-Silent-Setup cannot run other setups in silent mode, the plugins must therefore be installed as silent, too:
Setup IPEmotion PlugIn IPETRONIK LOG.exe /S /v/qn
Setup IPEmotion PlugIn IPETRONIK CAN.exe /S /v/qn

LOGGER-Plugin setup copies LOG2PC-Core into Temp directory and installs LOG2PC-Core in Silent mode, which must also be installed separately:
Setup LOG2PC Core.exe /S /v/qn

CAN-Plugin setup copies CAN-Server into Temp directory and installs CAN-Server in Silent mode, which must also be installed separately:
msiexec /i ".../IPETRONIK CAN-Server.msi"/qn

If directories are used, which differ from the standard directories, the respective property has to be set:
INSTALLDIR="Directory for programs"
INSTALLDIR_USERDATA="Directory for user data"
INSTALLDIR_APPDATA="Directory for application data"
If directories contain spaces \" has to be used.
Example:
Setup IPEmotion.exe /S /v"/qn INSTALLDIR=C:\Programs\Example\IPEmotion INSTALLDIR_USERDATA=D:\User data\IPEmotion"
Please note that the program data and application data cannot be used simultaneously by

different IPEmotion versions.

Deinstallation runs with Setup.exe via the /X key by using the setup of the version to be uninstalled.
Example:
Setup IPEmotion.exe /S /X /v"/qn"

4.3 IPEmotion License

The following chapter offers you an overview about the licensing process for the IPEmotion software. By using this licensing, optional program features, which depend on the purchased IPEmotion edition, are available after a successful installation of IPEmotion. Please find further information according the editions in chapter *3.1 IPEmotion editions*.

IPEmotion contains basically at delivery all program features. The corresponding functions and contents are unlocked by using the licensing.

The license model of IPEmotion differs between the following three basic models:

- Free demo version for 30 days with full functionality
- Free basic version with limited functionality
- Several versions against charge with graded functionlity

The free demo version for 30 days allows you to get to know IPEmotion with unlimited functionality. The free but limited basic version shows you the functionality of the versions against charge.

Before being able to activate the software, you have to register on the IPEmotion homepage www.ipemotion.com.

The following activation runs online or by e-mail. A use of the software is not possible without a prior valid activation of IPEmotion!

4.3.1 Demo version

The free demo version for 30 days must be activated. You get the license key immediately after the registration. Enter this license key into the *IPEmotion Licensing* dialog at first start of IPEmotion. After the expiration of the 30 days, the demo version turns automatically into the free basic version, which has not to be unlocked.

4.3.2 Basic version

The free basic version must be licensed. At entering the purchased license key at first start of IPEmotion, the basic version is activated and can be used with limited functionality. An unlock process is not necessary.

4.3.3 Versions against charge

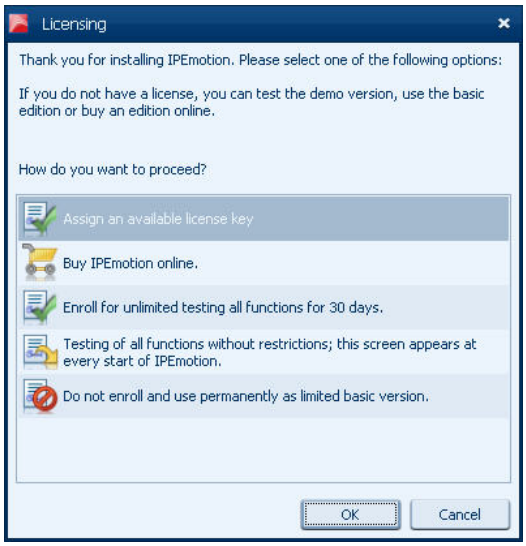
All versions against charge must be activated and unlocked. The activation runs at first start of IPEmotion. The versions against charge have to be unlocked within 30 days. Otherwise, the purchased version turns automatically into the basic version with limited functionality.

4.3.4 Licensing IPEmotion

Follow the instructions for installing IPEmotion and directly license it for this PC.

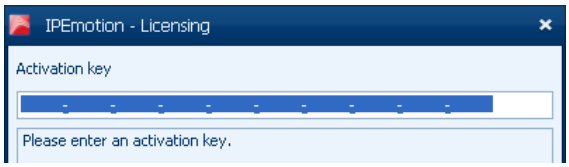
1. Launch IPEmotion from the menu **Start** → **Programs** → **IPETRONIK** → **IPEmotion**.

2. The appearing dialog shows an overview of possible steps. Select one of the listed options.


Licensing
Thank you for installing IPEmotion. Please select one of the following options:
If you do not have a license, you can test the demo version, use the basic edition or buy an edition online.
How do you want to proceed?
Assign an available license key
Buy IPEmotion online.
Enroll for unlimited testing all functions for 30 days.
Testing of all functions without restrictions; this screen appears at every start of IPEmotion.
Do not enroll and use permanently as limited basic version.
OK
Cancel

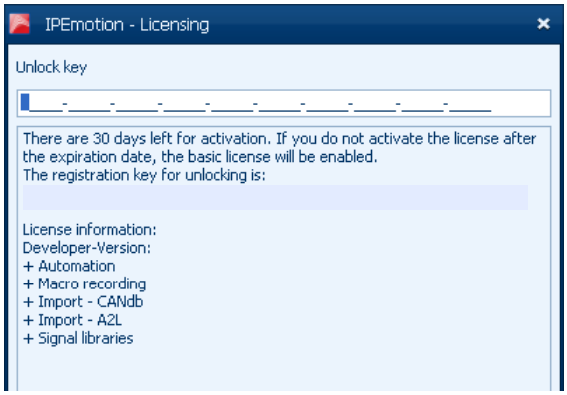
- Assign an available license key. – Follow the instructions for registering and unlocking IPEmotion (see steps 3 – 4).
- Buy IPEmotion online. – Get the desired IPEmotion version online and follow the licensing process (see steps 1 – 4).
- Enroll for unlimited testing of all functions for 30 days.
- Testing of all functions without restrictions; this screen appears at every start of IPEmotion.
- Do not enroll and use permanently as limited basic version.

3. Enter in the **IPEmotion – Licensing** dialog a valid **activation key**. Confirm your selection with **Assign**. The license information and all available version dependent components are listed in the description field.



IPEmotion can now be used for 30 days. A version against charge has to be unlocked within 30 days. Otherwise, the purchased version turns automatically into the basic version with limited functionality.

4. To finally unlock IPEmotion, you need an unlock key. Enter the shown registration key in the IPEmotion homepage or send it to license@ipemotion.com. After that, you receive the unlock key. Enter this **Unlock key** in the corresponding field and confirm with **Assign**. The license information and all available version dependent components are listed in the description field.


IPEmotion - Licensing
Unlock key
There are 30 days left for activation. If you do not activate the license after the expiration date, the basic license will be enabled.
The registration key for unlocking is:
License information:
Developer-Version:
+ Automation
+ Macro recording
+ Import - CANdb
+ Import - A2L
+ Signal libraries

5. Exit the *IPEmotion – Licensing* dialog with **Close**.

*The IPEmotion – Licensing dialog can also be opened by using the **About → Licensing** function.*

From IPEmotion V01.05 on, you have the ability to license IPEmotion with a dongle. The dongle is a special USB flash drive, which automatically starts the IPEmotion installation at connecting to PC.

Single license dongle

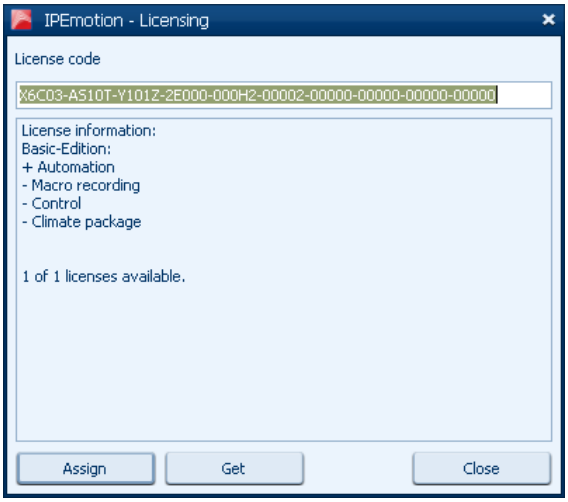
The dongle includes a single license for IPEmotion. If you have already installed IPEmotion, a manual input of the license is required (see steps 3-4). The license is stored in the directory generated by the dongle. The dongle must always be connected to PC at working with IPEmotion. If the dongle is removed during operation, IPEmotion is closed, too (with delay).

Multiple license dongle

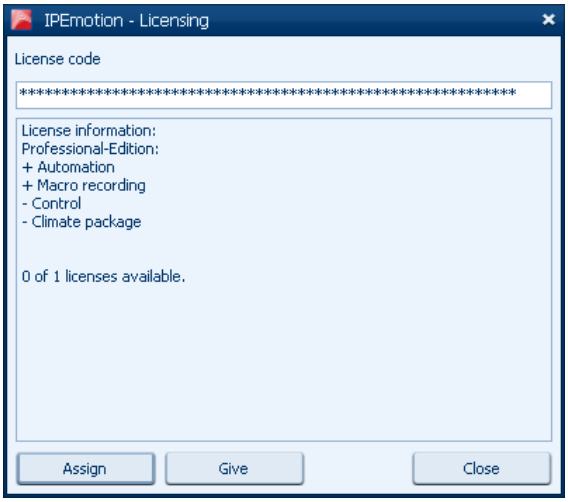
The multiple license dongle includes at least 1 license and offers a decisive advantage: the dongle must **not** remain connected with the PC at working with IPEmotion! Furthermore, you can return a license to the dongle that is no longer required. The IPEmotion software is then executed as Basic edition.

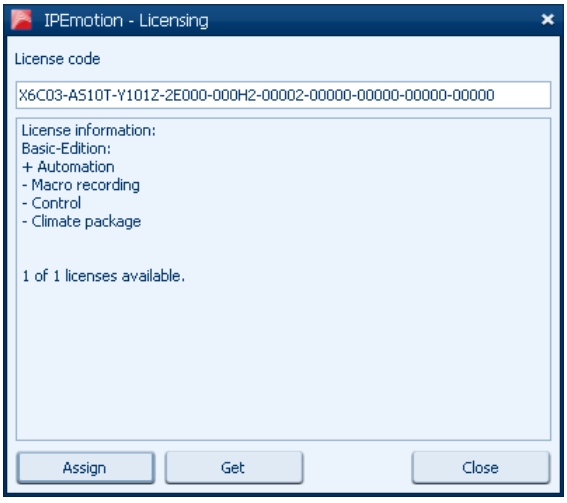
- Start IPEmotion.
- Connect the dongle with the PC and wait until the blue LED at the dongle is no longer flashing but is red. This process can take some seconds.
- Open the dialog **IPEmotion – Licensing**.

Enter the corresponding license code and click **Get**.



The assigned license code is now displayed as hidden and the included license information is listed. Click **Give** to return the license to the dongle. IPEmotion is now available as Basic edition.





You can now disconnect the dongle from the PC and work with IPEmotion.

4.4 Uninstalling IPEmotion

The following chapter shows the deinstallation process of IPEmotion.

For removing IPEmotion you have two possibilities:

- The option **Remove** of the IPEmotion installation program.
- The option **Add or Remove Programs** for IPEmotion in the Control Panel.

With both methods you can remove IPEmotion files, folders and registry entries from your computer, which has been created during the installation.

Please note that the installed plugins are not uninstalled automatically but have to be deleted separately!

Removing IPEmotion with the installation program

To do so, proceed as follows:

1. Click in the menu **Start** on your computer on **Settings** and then **Control Panel**.

2. Double-click in the **Control Panel** on **Add or Remove Programs.**

3. Select from the program list the entry **IPEmotion** and click **Change** to start the installation wizard.

Click **Next** to advance to the **Program maintenance** screen.

4. Program maintenance: This screen allows you to modify, repair or remove IPEmotion. Select **Remove** and click **Next** to continue.

5. Remove the program: This screen indicates that your installation is now ready to remove. Click **Remove** to start the removing process.

6. Uninstalling IPEmotion: A progress bar is shown during the uninstalling process.

7. InstallShiel Wizard Completed: This screen is shown after the successful deinstallation. Click **Finish** to exit the installation wizard.

After removal, IPEmotion is no longer indicated in the program list.

Removing IPEmotion with the deinstallation function of the Control Panel

To do so, proceed as follows:

1. Click in the menu **Start** on your computer on **Settings** and then **Control Panel**.

2. Double-click in the **Control Panel** on **Add or Remove Programs.**

3. Select from the program list the entry **IPEmotion** and click **Remove** to start the installation wizard.

4. Click **Yes** to start the deinstallation.

5. A progress bar is shown during the uninstalling process.

6. After the successful removal of IPEmotion, the program has been removed from your computer and is no longer indicated in the program list.

5 Getting Started

The following chapter offers an overview of the available commands and their functions. In addition, the first basic steps for using IPEmotion are explained.

5.1 The title bar

The title bar contains the quick access bar (see chapter 5.5), the software name, as well as, a tool bar with the following functions:

Help – Open the documentation IPEmotion.pdf where you can find useful information for a safe and clean application of the software.

Minimize – Minimize the application window of IPEmotion and place it in the task bar of your desktop.

Maximize – Make the application window visible on your desktop and refit the prior size.

Close – Close the IPEmotion application.

5.2 The application button

Click on the button to open the application menu.

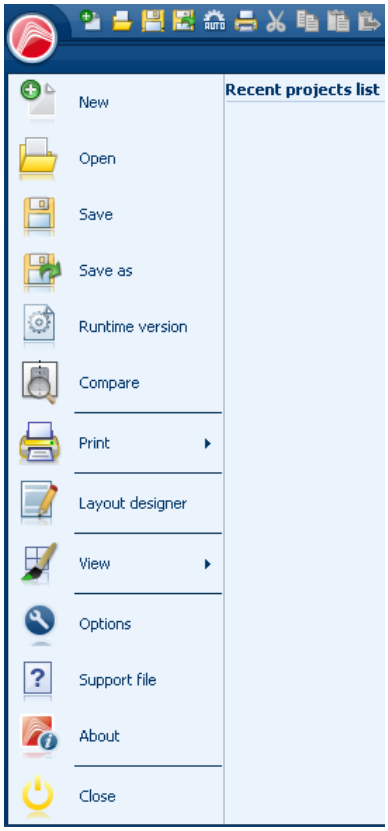
5.3 The application menu

The application menu contains basic functions as: **New**, **Open**, **Save**, **Save As**, **Runtime version, Print** and **Close**, as well as, further properties such as **View**, **Options**, **Support file** and **About**.

The right partial view of the application menu contains a list of the recently used projects.

The **Print** function is implemented with limited functionality and not yet localized.

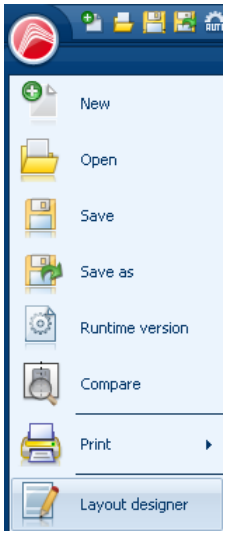
The **View** function contains the menu points **Message window** and the **Reset** command. Show or hide the message window and reset the displaying configuration to the default parameters.



5.3.1 Layout designer

IPEmotion offers the ability to create individual reports with an integrated editor. A predefined layout guarantees a consistent style of all report pages. Every object (text, line, image, etc.) can be added to the editor with Drag&Drop and modified (change size, color, etc.).

Open the Designer with the **Layout designer** menu point. The last used layout is loaded at starting the layout function.



The current version offers the following standard elements:

- Image
- Text
- Line
- Rich text
- Arrow

The layout creation in IPEmotion allows to choose between 5 standard formats:

- Empty layout
- IPELayout Landscape A4

- IPELayouot Landscape Letter
- IPELayout Portrait A4
- IPELayout Portrait Letter

Use the **Open** button to load user-defined layouts. Headers and footers can be freely selected and allow place for comments (e.g. project properties). Furthermore, different object (image, text, etc.) can be added.

The **Standard layout** button allows to define the current layout as standard. This activates the layout for the preview and the reporting page.

Field commands

Field commands are an important feature of word processing programs and offer the ability to integrate variable information in the text. Field commands include information, which is automatically updated, e.g. date, time. Project-specific parameters can also be used as field commands, e.g. device used for acquisition, measurement software.

Please note the following regulations concerning formatting:

- The following characters are allowed: letters from A-Z and a-z, digits, underscore.
- No special characters are allowed.
- The first character must be a letter.
- Field commands are always capitalized.
- Field commands can include several parameters or arguments.
- Several field commands can be used together (separated by space).

The following table shows all currently available IPEmotion field commands:

Option	Formatting	Functionality
System-specific Date and time	%DATETIME(format)%	Date and time format: Date/time formatting as follows: format = m/dd/ -> 9/26/)
Online-specific		
Different project properties	%PROJECTPARAM(key)%	The *global* project properties defined by the user are available. key: key of the project property from ProjectPar (e.g. SerialNumber)

Analysis-specific		
Different project properties	%DATAPROPERTY(key; noDataGroup)%	The project properties of the measurement files defined by the user are available. key: key of project property from parameter field (or header of file) noDataGroup: define number of data group from data pool for defining the project property. If none is defined (%DATAPROPERTY(key)%), the first is chosen.

IPEmotion offers global project properties. You have access to any project property with field commands. Please note the following specification concerning the formatting and the availability of field commands:

- If a field command is entered incorrectly, the original text remains.
- If a field command is invalid but has a correct format, the text turns into “Error”.
- If a field command is valid but contains no data, the text turns into “No data”.
- Field commands are partially context-sensitive. That means that the availability of field commands can be restricted and the commands cannot be used for every page.

Script calls

IPEmotion offers the ability to connect internal scripts with field commands, e.g. to calculate the average value of a channel. A field command with connected script has the following formatting:

%SCRIPTINVOKE(Script name;Function name;Argument1;...;ArgumentN)%

- Script name: name of the script
- Function name: function to be called with the script
- Argument1 – N: any number of arguments

If functions without a return value are called, the original text remains.

It is necessary to ensure that the script called with a field command does not run time-consuming operations. Calling the printing function or the print view can be significantly delayed because the script is first completely executed.

The following overview shows potential reasons for displaying the message “An error occurred in the script.”:

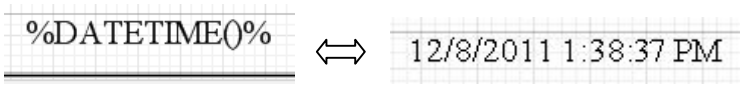
- A function not in the script is called.

- Wrong transfer parameters are entered (script name, function name, argument).
- The formatting of the field command is invalid.
- The script does not exist.

Field commands in layout designer

IPEmotion allows to use field commands with the **Text** and **Rich text** elements. The commands edited in the designer are interpreted at printing and in the print preview.

The **Field names** button allows to switch between the name of the field command and its content.



5.3.2 View

The **View** function includes the following points,

- Message window
- Status window
- PC status window
- Storage status window
- Output window

as well as, the commands:

- Reset
- Reset templates – Reset the templates of the View and Analysis main navigation tabs.

5.3.3 Using the options

With the **Options** entry, you have the ability to edit user-defined settings. You can define the following options:

- Frequently used
- Basic settings
- Appearance
- Data manager

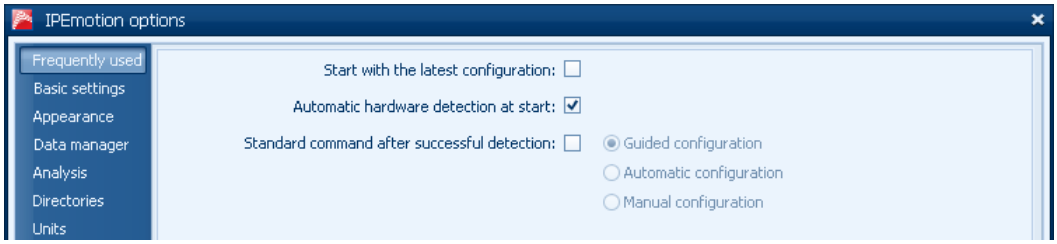
- Analysis
- Directories
- Units
- Hotkey
- PlugIns

The following section offers you a detailed overview over the available setting options.

Frequently used

Activate or deactivate **Start with the latest configuration** and define the settings for the **automatic hardware detection**. Activate or deactivate the **automatic hardware detection at start** of IPEmotion and select a possible **standard command after successful detection**:

- Guided configuration
- Automatic configuration
- Manual configuration

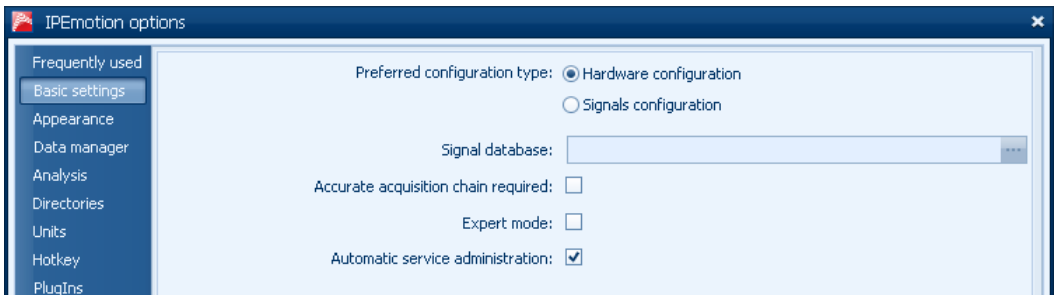


Basic settings

Select a **preferred configuration type**:

- Hardware configuration
- Signals configuration with selection of the signal database

Activate or deactivate the options: **Accurate acquisition chain required** and **Expert mode**.



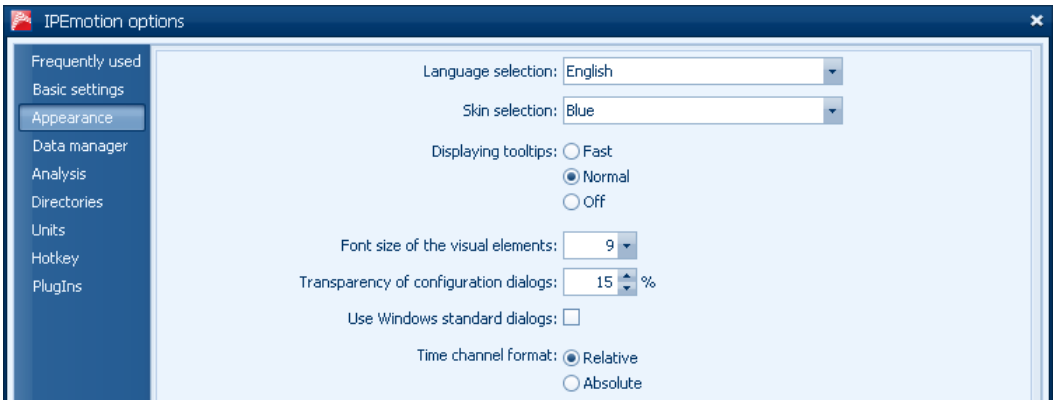
Appearance

Define your view settings according the following listed points:

- Language selection
- Skin selection
- Displaying tooltips
- Font size of the visual elements
- Transparency of configuration dialogs (0 – 30 percent)

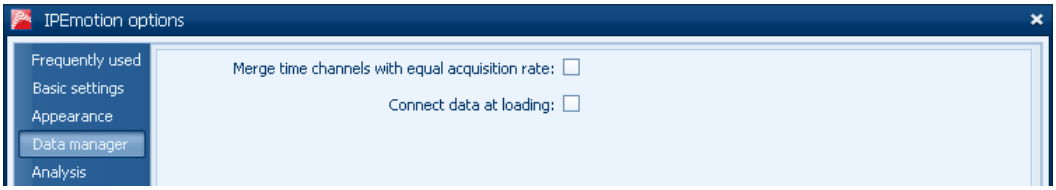
Activate or deactivate the use of the **Windows standard dialogs** for the file and directory selection.

The *Open file* dialog is skin-enabled, i.e. it is shown in the selected user interface type.



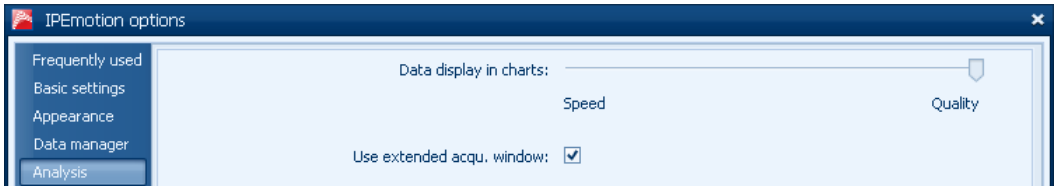
Data manager

Define the **Time channel format** as *Relative* or *Absolute* (This setting is currently not supported for the export into external formats!) and activate or deactivate the option: **Merge time channels with equal acquisition rate**.



Analysis

Select the **points per diagram graph**. Define if all signals are considered in the analysis diagrams at drawing the graph or only the samples. Move the bar accordingly to the preferred speed or quality.

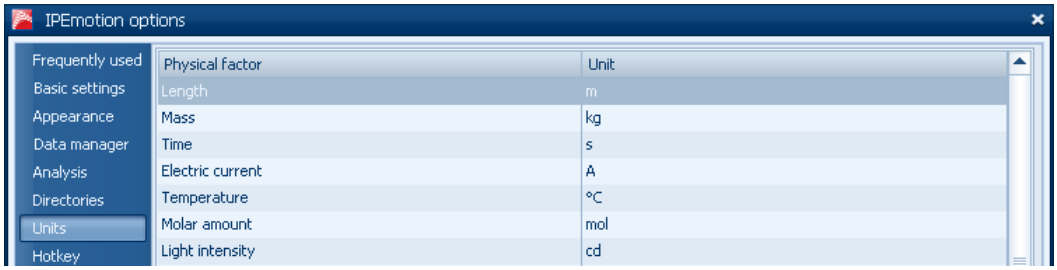


Directories

IPEmotion additionally offers to the selection of the listed directories the possibility to import the user settings (language, selected columns, ...), as well as, the plugin options. The user settings are stored in the IPEmotion application data in the “Settings.xml“ file and the files of the “UserSettings“ sub folder. Please note with Settings.xml that the directories for the user data directories and the application data directories are stored in the same file. The plugin options are stored in the IMO files in the plugin folder of the application data.

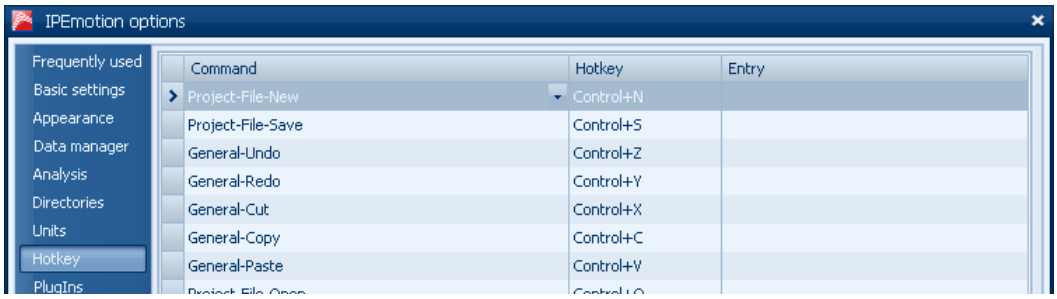
Units

Get an overview according the common physical values and their respective unit and edit them.



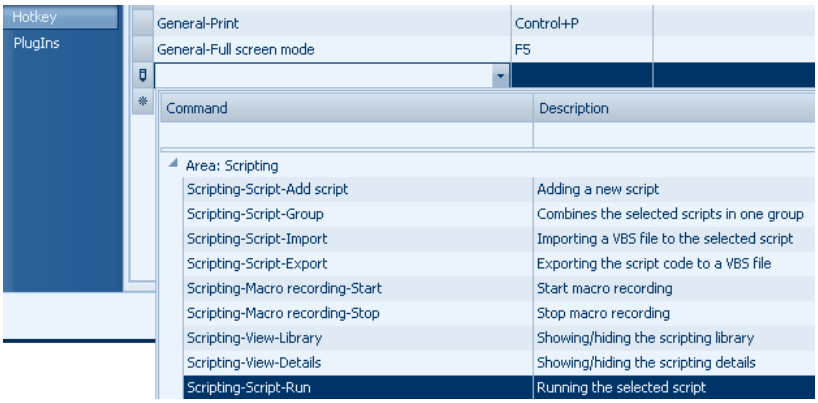
Hotkey

Send specific commands to IPEmotion by using the hotkeys.



IPEmotion offers you the ability to connect hotkeys with scripts or programs and to run them per key activation or click. You can load internal scripts from the scripting environment, as well as, external vbs files. The external scripts are then loaded into the scripting environment.

Open the **Area: Scripting** entry and double-click **Scripting-Script-Run**. Assign a hotkey to the new command. Additionally select the desired script within the **Entry** column. Confirm your definitions with **OK**.



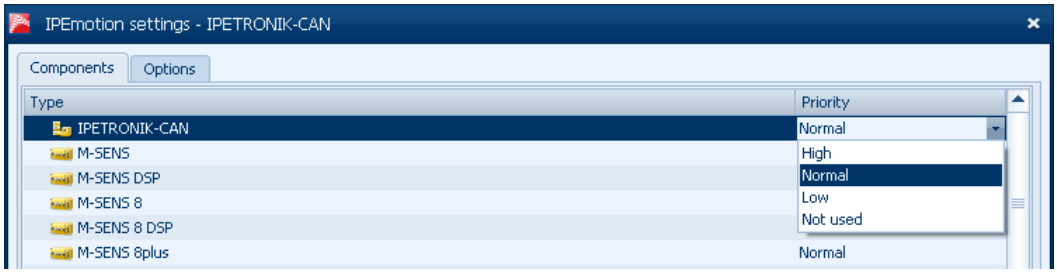
PlugIns

Activate or deactivate the **hardware systems** to be used.

Plugin-specific options

You can define additional settings for the respective plugin with the specific options.

With the button, you have the ability to define the **components** (module type and priority, e.g. for the type selection of the Dry configuration) of the respective hardware system and to edit additional **options** settings.



The selection of the hardware components for the configuration by using a signal database is based on the **Priority**. This preselection with a priority assignation of the system components facilitates the device selection and improves the system speed.

The **High** priority defines a preferred use of the corresponding hardware component at configuring with a signal database. The hardware components, which are defined with the **Not used** priority, cannot be selected for an acquisition.

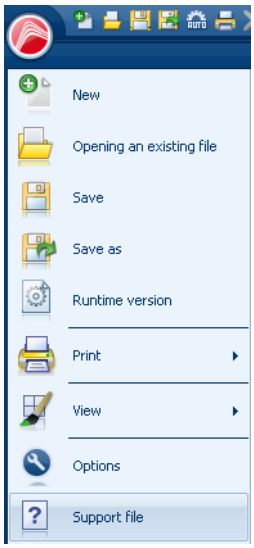
The button allows you to select of different installed plugin versions. If a version description is marked with =, this version will always be used – even if the latest version is installed.

The button opens the manual (pdf) of the respective plugin (if available).

The Download button opens the PlugIn download page at www.ipemotion.com in your standard browser.

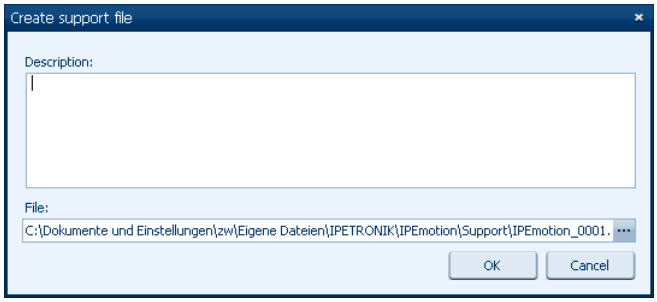
5.3.4 Creating a support file

With the **Support file** entry of the application menu, you have the ability to create a support file and add and/or edit own comments and error descriptions.



Enter in the appearing **Create support file** screen an error description. Accept the default location for the file. To select another location click on the ... symbol.

After you have specified the location and a user-defined file name, click **Save** to return to the **Create support file** screen.



After clicking on **OK** a zip file is generated that contains the error description, as well as, the following information:

- System information (Windows version, computer name, free memory on the local drives, …)
- Current configurations (acquisition, online view, script configurations)
- Trace files (.NET, C++)

If you have any problems while working with IPEmotion, send us this support file at support@ipemotion.com.

5.4 The quick access bar

The quick access bar is integrated in the title bar and contains functions that are frequently used. Each of these functions is displayed as an icon. The position of the quick access bar can be customized by the arrow symbol .

New – Create a new file.

Open – Open an already existing configuration.

Save – Save the current file(s).

Save as – Save the current file(s) with a new name.

Automatic generation – Automatically generate a configuration by reading the connected devices for measuring and visualizing the signals.

Quick print – Print the current view directly on the standard printer. This function is implemented with limited functionality.

Cut – Move the selected elements into the clipboard.

Copy – Copy the selected elements into the clipboard.

Paste – Enter the elements from the clipboard.

Delete – Delete the selected elements.

Clean – Delete all subordinate elements.

Undo – Undo your last action(s).

Redo – Redo previously undone actions step by step.

Properties – Open the configuration dialog.

Options – Define user-defined properties.

Help – Open the IPEmotion.pdf documentation where you can find useful information for a safe and clean application of the software.

About – Get an overview of the software version and license information of the IPEmotion software.

5.5 The main navigation tabs

The main navigation tabs allow a quick activation of the different main functions of IPEmotion. A tab displayed in light blue indicates an active function.

IPEmotion is designed to follow the main navigation tabs from left to right. Use this reasonable order like a read thread, which guides you step by step to a successful acquisition.

Project – Define your general user-defined project data.

Signals – Configure the connected acquisition systems and hardware modules.

Acquisition – Configure the desired storage groups and channels.

View – Take a measurement defined by the connected hardware modules and the set configurations.

Data manager – Manage your stored acquired data in all the supported formats.

Analysis – Visualize your channels with diagrams.

Scripting – Automate your acquisition sequences.

Info – Get a basic overview and general support.

5.5.1 Info

The chapter offers a basic overview of the IPEmotion software. In addition, it shows useful advices and tips and tricks on how to use IPEmotion.

The view Info is divided into the following menu points:

- Welcome
- Release Notes (only in English)
- Red thread

The main menu points (also called Main Navigation Tabs) allow you a clear and quick activation of the different main part of IPEmotion. A light blue colored tab indicates an active main menu point.

IPEmotion is designed that way that you can follow the main navigation tabs from left to right. Use this logical order like a red thread, which guides you step by step to a successful measurement.

- Tips and tricks

This page offers useful tips and tricks to facilitate your start in IPEmotion and the work with the software.

- Keyboard handling

This page offers an overview about the keyboard navigation within the *View* and *Analysis* main navigation tabs.

- Customizing

Please find useful information about how to edit IPEmotion accordingly your specific requirements.

If you wish to receive more detailed information, the Expert mode is recommended. Activate this mode within Options of the “Basic settings”. Extended levels of the configuration in the expert mode are e.g.:

- Setup tree includes more sub-nodes for some entries
- Status channels show trigger status
- Offset, amplitude, and frequency can be changed during measurement

The **/ADP command line option** is recommended for users who want to use IPEmotion with a specific plugin. /ADP allows to use different instances (copies of given schemata) with different application data. That means that the same IPEmotion version can be used with different plugin combinations. This naturally includes all other application data, e.g. skin, user folders, hotkeys. To use an IPEmotion version with different application data, proceed as follows:

- Copy the existing IPEmotion application data folder of the corresponding version and choose any name
- Create a new desktop link to the IPEmotion version (e.g. by copying the existing desktop link)
- Add /ADP”Path of copy of application data folder\<Title>” to the target properties (space before /ADP and quotation marks are mandatory, additional title is optional)

- Scripting

  Edit IPEmotion accordingly your specific requirements and easily automate your process with the automation interface in IPEmotion. The available interfaces depend on the acquired edition.

- Documentations

- Contact and support

5.6 Getting Started

5.6.1 Launching IPEmotion

IPEmotion - Licensing

Launch IPEmotion from the menu **Start** → **Programs** → **IPETRONIK** → **IPEmotion** and enter a valid livense key in the **IPEmotion – Licensing** dialog.

Confirm your entry with **Assign**. The license information and all available version dependent components are listed in the description field. Accept the activation of the license key with **OK**.

Exit the *IPEmotion – License* dialog with **Close**.

Logger selection

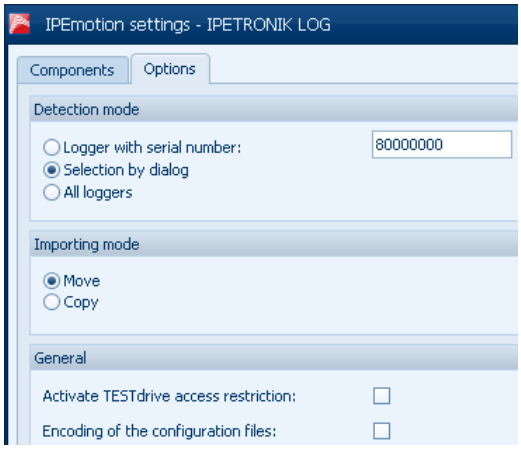
All detected data loggers are listed in the **Logger selection** dialog at starting IPEmotion. You have the ability to select those loggers to access. To activate or deactivate the desired logger, click in the small box of the **Selection** column.

The logger selection dialog is displayed by default and can be defined by using the IPEmotion Options.

- Select the menu point **PlugIns** within the **IPEmotion Options** .

- Select **IPETRONIK LOG** and click on the **Settings** button.

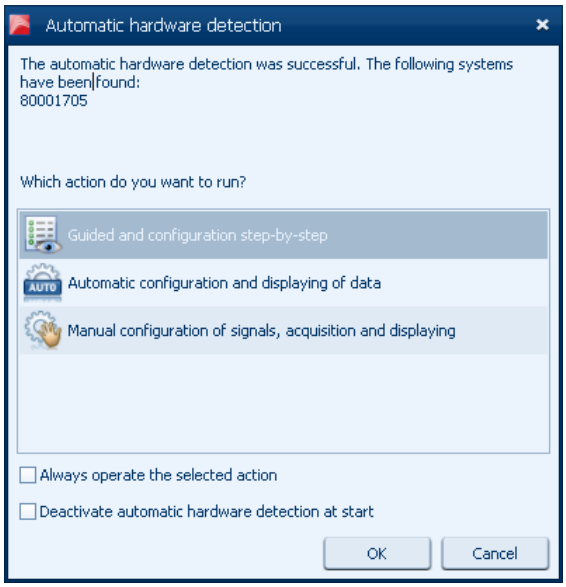
- Within the **Options** tab you have the ability to define the **Detection** and **Importing mode**.



- Activate or deactivate the mode for detecting the data logger.
  - Logger with serial number
  - Selection by dialog
  - All loggers
- Activate or deactivate the mode for importing the data from the logger.
  - Move (Select *Move* to copy and delete the data from the logger.)
  - Copy (Select *Copy* to copy the data from the logger.)
- Activate within the General section the TESTdrive access restriction and/or the encoding of the configuration files.

Confirm your selection with **OK** and close the IPEmotion Options dialog with **OK**.

5.6.2 The automatic hardware detection


Automatic hardware detection
The automatic hardware detection was successful. The following systems have been found:
80001705
Which action do you want to run?
Guided and configuration step-by-step
Automatic configuration and displaying of data
Manual configuration of signals, acquisition and displaying
Always operate the selected action
Deactivate automatic hardware detection at start
OK
Cancel

The dialog window **Automatic hardware detection** appears at opening IPEmotion for the first time. Select the desired **action** for your next step and click on **OK**.

You have the ability to decide, if the selected action should always be taken at opening IPEmotion. To activate this option, click the small box ***"Always operate the selected action"****. Please note that this option is only available if the hardware is already connected and detected!*

If the dialog window Automatic hardware detection *should not be shown again at opening IPEmotion, click the small box* ***"Deactivate automatic hardware detection at start"****.*

The *Automatic hardware detection* screen allows you to safely and quickly use IPEmotion without previous knowledge. It is an introducing help for simply and intuitively operating basic steps.

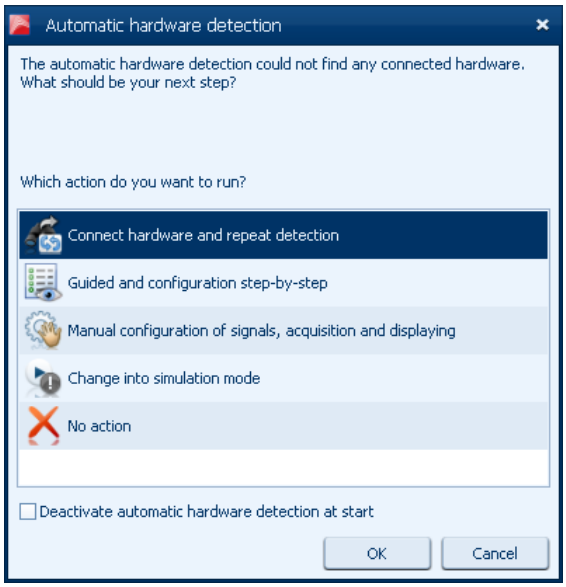
You can select one of the following actions:

- Connect hardware and repeat detection
- Guided and configuration step by step
- Automatic configuration and displaying of data
- Manual configuration of signals, acquisition and displaying
- Change into simulation mode
- No action

Connect hardware and repeat detection

Select the **Connect hardware and repeat detection** option and confirm with **OK**.

Please note that this option is only available if no hardware is connected or an automatic detection of the connected devices was not successful!

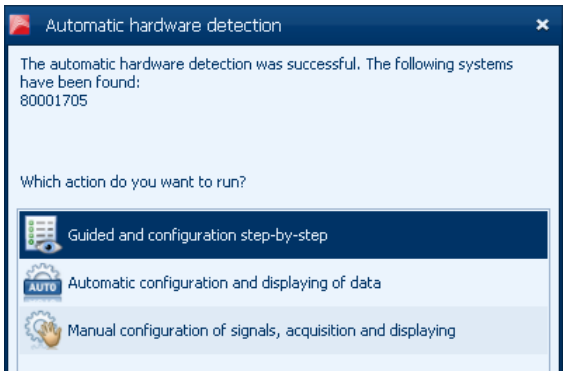

Automatic hardware detection
The automatic hardware detection could not find any connected hardware.
What should be your next step?
Which action do you want to run?
Connect hardware and repeat detection
Guided and configuration step-by-step
Manual configuration of signals, acquisition and displaying
Change into simulation mode
No action
Deactivate automatic hardware detection at start
OK
Cancel

Guided and configuration step by step (User guidance)

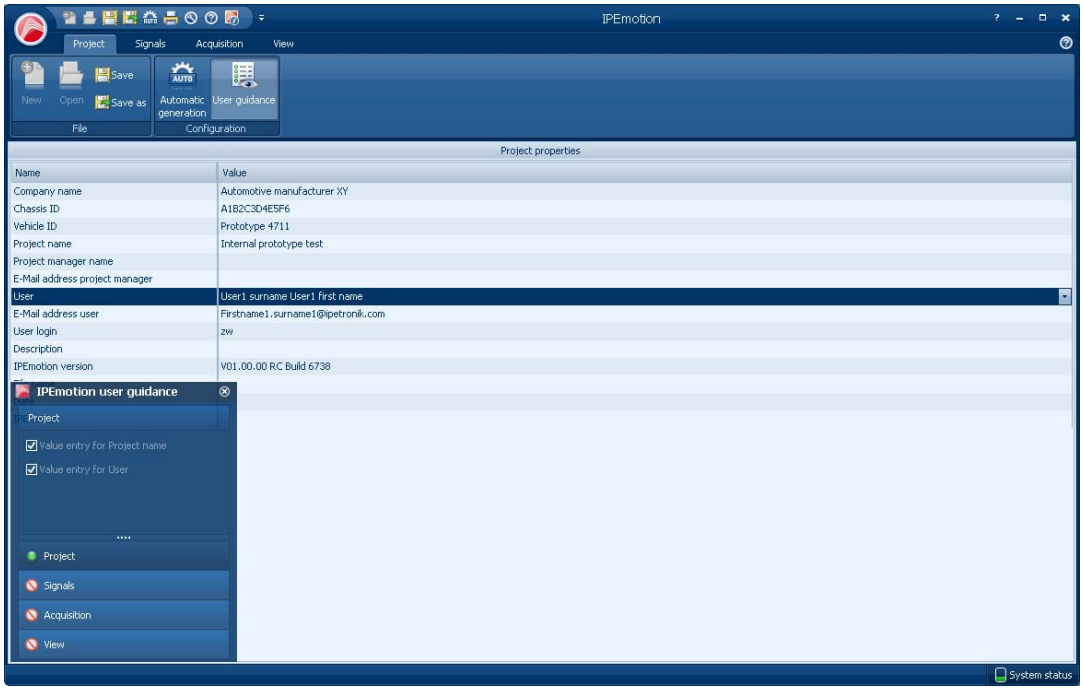
The user guidance explains step by step how to create a project, define signals, operate an acquisition and configure the displaying of the acquired data.

Each step to do is highlighted with a red background or red font color and points out the step by step proceeding.

Select the **Guided and configuration step by step** option and confirm with **OK**.


Automatic hardware detection
The automatic hardware detection was successful. The following systems have been found:
80001705
Which action do you want to run?
Guided and configuration step-by-step
Automatic configuration and displaying of data
Manual configuration of signals, acquisition and displaying

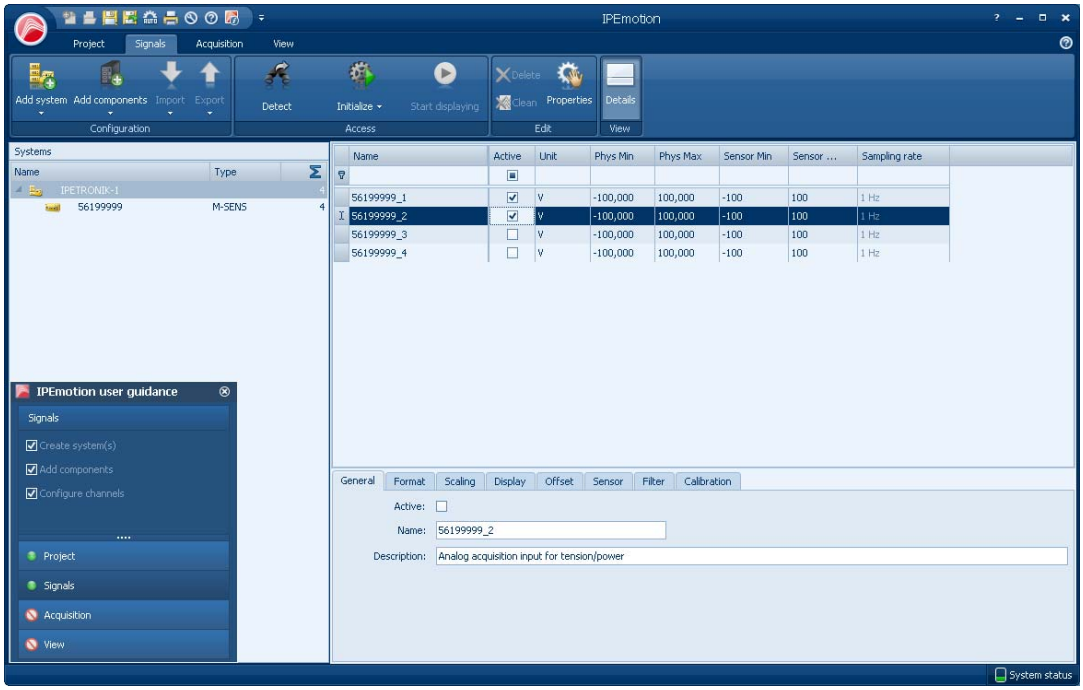
First of all, enter in the appearing **Project** window a **Project name** and check the field **Value entry for Project name**. Afterwards, enter a **User** and check the field **Value entry for User**. For detailed descriptions of the project settings, please consult chapter *6.1 Project*.



The first step *Project* is then defined as completely done and marked with a green symbol.

Select the next step **Signals** to continue.

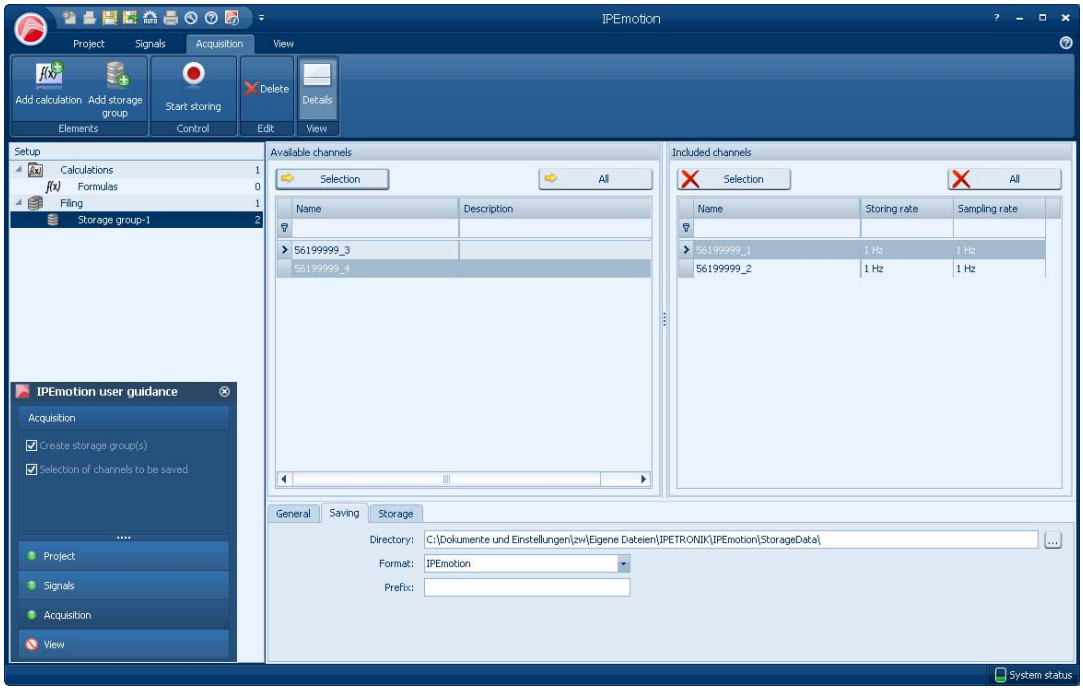
In the appearing **Signals** window create the desired **system** and check the field **Create system(s)**. Select **components** and check the field **Add components**. Define your **channels** and check the field **Configure channels**. For detailed descriptions, please consult chapter *6.2 Signals*.



The step *Signals* is then defined as completely done and marked with a green symbol.

Select the next step **Acquisition** to continue.

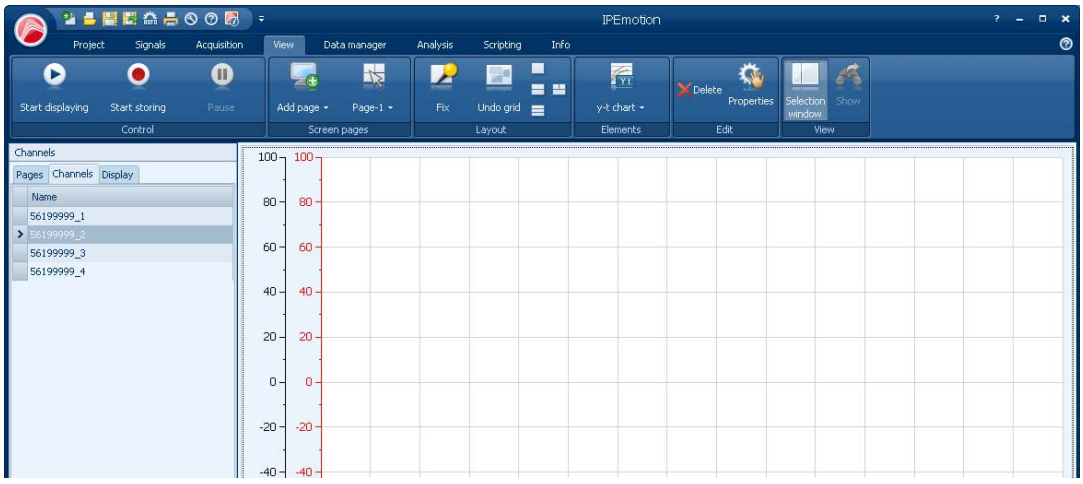
In the appearing **Acquisition** window add a **storage group** and check the field **Create storage group(s)**. Select the desired **channels** and check the field **Selection of channels to be saved**. For detailed descriptions, please consult chapter *6.3 Acquisition*.



The step *Acquisition* is then defined as completely done and marked with a green symbol.

Select the next step **View** to continue.

In the appearing **View** window create pages/screens and check the field **Create screen page(s)**. Select the desired **visual element** and check the field **Select type of visual element**. Add your **channels** and check the field **Add channels**. For adding the channels you have the ability to use the Drag&Drop function. For detailed descriptions, please consult chapter *6.4 View*.



The step *View* is then defined as completely done and marked with a green symbol.

Confirm the appearing IPEmotion dialog with **OK**.

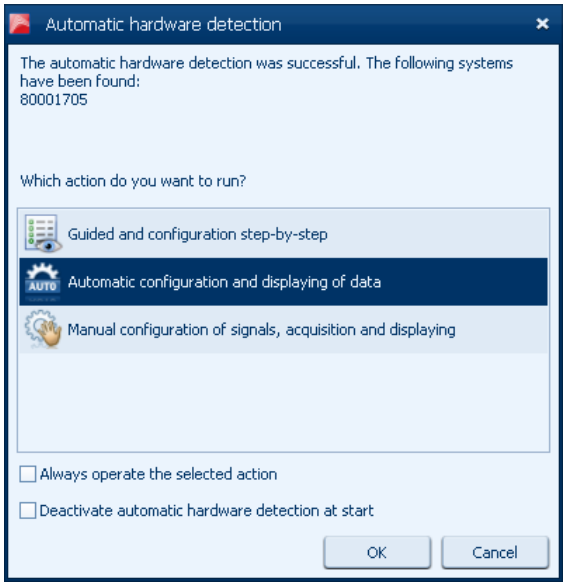
You can now start an acquisition and store the data. To do so, proceed as follows:

1. Click in the **View** menu on the button **Start displaying** to start the displaying of the acquisition data.

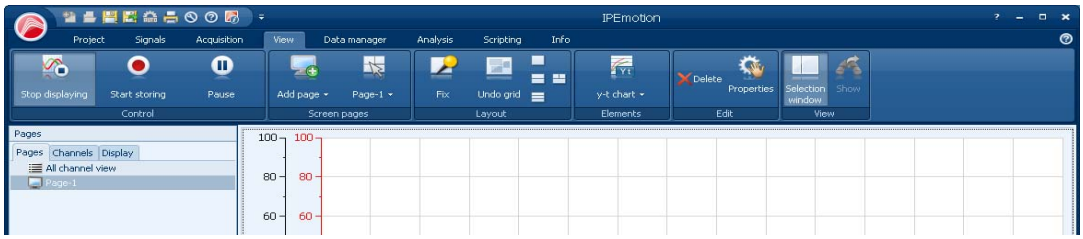
2. Click on the button **Start storing** to record the acquisition data.

Automatic configuration and displaying of data

Select the **Automatic configuration and displaying of data** option and confirm with **OK**.

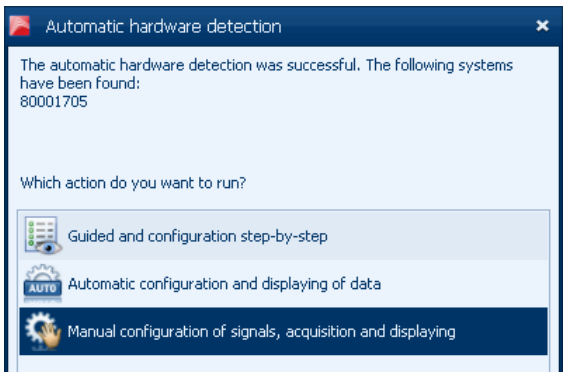

Automatic hardware detection
The automatic hardware detection was successful. The following systems have been found:
80001705
Which action do you want to run?
Guided and configuration step-by-step
Automatic configuration and displaying of data
Manual configuration of signals, acquisition and displaying
Always operate the selected action
Deactivate automatic hardware detection at start
OK
Cancel

The displaying starts automatically on the basis of the connected hardware. Click on the button **Stop displaying** to stop displaying the acqiured data.



Manual configuration of signals, acquisition and displaying

Select the **Manual configuration of signals, acquisition and displaying** option and confirm with **OK**.


Automatic hardware detection
The automatic hardware detection was successful. The following systems have been found:
80001705
Which action do you want to run?
Guided and configuration step-by-step
Automatic configuration and displaying of data
Manual configuration of signals, acquisition and displaying

You will find detailed information on how to use the manual configuration option and operate an acquisition in chapter 5.7.2 *The manual configuration*.

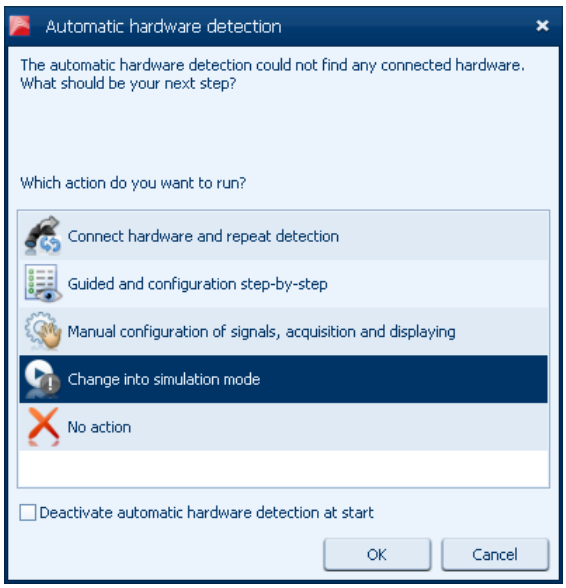
Change into simulation mode

Select the **Change into simulation mode** option and confirm with **OK**. The simulation mode offers you the possibility to start a *Dry configuration*.

You will find detailed information on how to use the simulation mode option and operate an acquisition in chapter 5.7.2 *The manual configuration*.

Please note that this option is only available if no hardware is connected or an automatic detection of the connected devices was not successful!

In addition, the simulation mode is set automatically as inactive at connecting and detecting hardware!

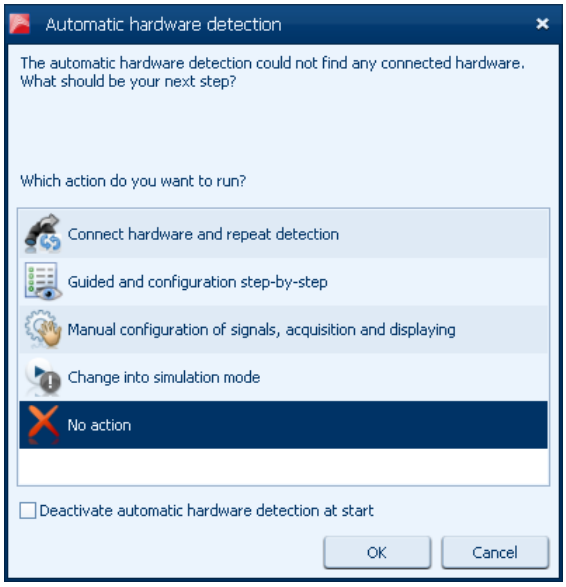

Automatic hardware detection
The automatic hardware detection could not find any connected hardware.
What should be your next step?
Which action do you want to run?
Connect hardware and repeat detection
Guided and configuration step-by-step
Manual configuration of signals, acquisition and displaying
Change into simulation mode
No action
Deactivate automatic hardware detection at start
OK
Cancel

No action

Select the **No action** option and confirm with **OK**.

Select the **No action** option in combination with the activation of the setting **Always operate the selected action** and IPEmotion operates an automatic hardware detection at every start. In this case, the *Automatic hardware detection* screen is not shown again. Confirm with **OK**.

Please note that this option is only available if no hardware is connected or an automatic detection of the connected devices was not successful!


Automatic hardware detection
The automatic hardware detection could not find any connected hardware.
What should be your next step?
Which action do you want to run?
Connect hardware and repeat detection
Guided and configuration step-by-step
Manual configuration of signals, acquisition and displaying
Change into simulation mode
No action
Deactivate automatic hardware detection at start
OK
Cancel

5.7 Three quick ways to a precise acquisition

You generate configurations with IPEmotion with little effort and acquire data with high precision.

IPEmotion offers you three different possibilities to generate configurations:

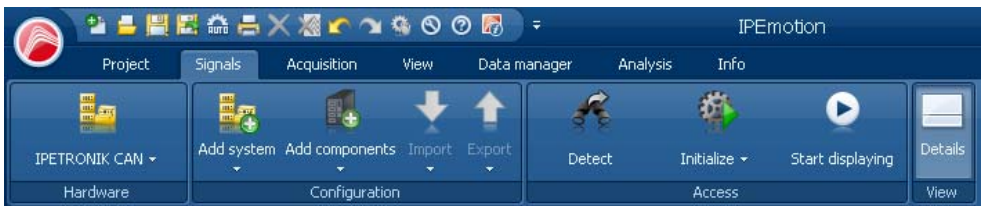
- Automatic configuration
- Manual configuration
- Configuration by using a signal database

5.7.1 The automatic configuration

By using the *automatic configuration* the connected hardware devices are read and a configuration of the signals is generated automatically.

The automatic configuration function requires that the hardware is connected to the CANbus and active. If this is not the case, connect the desired devices to the CANbus of your computer.

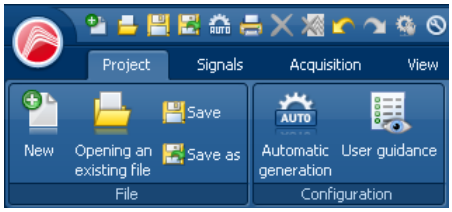
The command window **Configuration** is accessed through the **Signals** menu. With this command you can select the active hardware platform.



The displayed hardware system depends on your selected installation type.

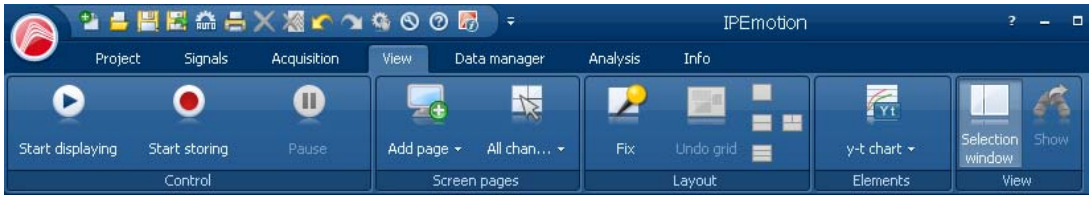
To acquire data with the **automatic configuration** proceed as follows:

1. Click in the menu **Project** on the **AUTO generation** button to start the automatic configuration generation process.



2. After the successful detection of hardware and initialization, the connected hardware devices are shown in the menu **View**.

3. Click in the menu **View** on the **Start displaying** button to start displaying the acquisition data.



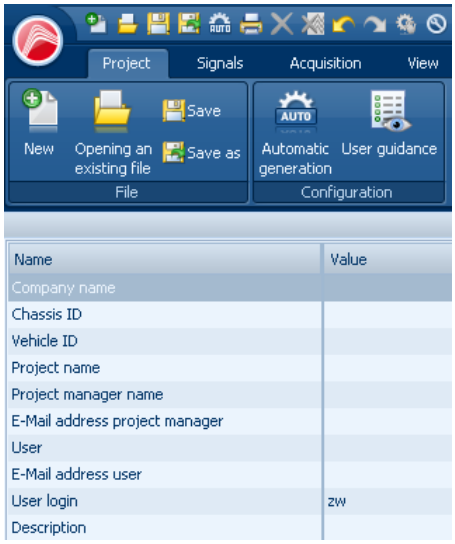
4. Click on the **Start storing** button to record the acquisition data.

5.7.2 The manual configuration

The *manual configuration* offers you the ability to make specific modifications of the acquisition devices.

The manual configuration function requires that the hardware is connected to the CANbus and active. If this is not the case, connect the desired devices to the CANbus of your computer.

First of all, define your project and enter in the **Project** window a **project name** and a **user name** afterwards.



In the **Signals** menu is the command window **Configuration**. You can now select the active hardware platform.

The displayed hardware system depends on your selected installation type.

To take an acquisition with the **manual configuration** proceed as follows:

1. Click on the button **Add system** to open select the desired system.

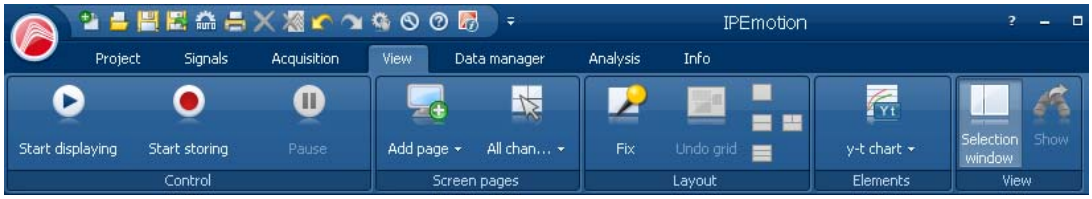
2. Click on the **Add component** button to expand the existing system by showing additional hardware devices and to set the respective number of the corresponding modules.

   Please note that the button is only activated if the respective system is selected in the window *Systems*.

3. Click on the **Initialize** button to initialize the hardware and to synchronize and configure the selected system on the basis of the data. At the hardware initialization the devices are switched into the configuration mode and following into the acquisition mode.

4. Click on the **Start displaying** button to start the displaying of the acquisition data.

5. Click in the **View** menu on the **Start storing** button to record the acquisition data.



5.7.3 The configuration using a signal database

IPEmotion offers you the ability to load a signal database from user-defined files or databases. To access a specific signal database in IPEmotion the signal database must be converted to an IPEmotion file format.

The conversion can be done with an external program. These user-defined programs are easily generated on request and offer the ability to import signal channels into IPEmotion.

First of all, you have to define the basic setting of IPEmotion to use the configuration with signals. Click on **Options** or open the dialog window **IPEmotion Options** by using the **application menu** and the **Options** function. In the **Basic settings** section select the configuration type **Signals configuration** and the desired signal database (*.mpc). Confirm with the **OK** button.

To create a configuration with a signal database proceed as follows:

1. In the **Signals** menu click in the window **Signals**.
2. Under the point **Signals** click on the **Import** button and select the **Signal import**.
3. Open the desired signal database (*.mpc) and select the desired **signals** by using a filter or multiple selections. Assign the signals with Drag&Drop or by using the arrow buttons.
4. Select the desired hardware in the Components column.

   The available hardware components are based on the assigned priority of the system settings within the IPEmotion → PlugIns → Settings.

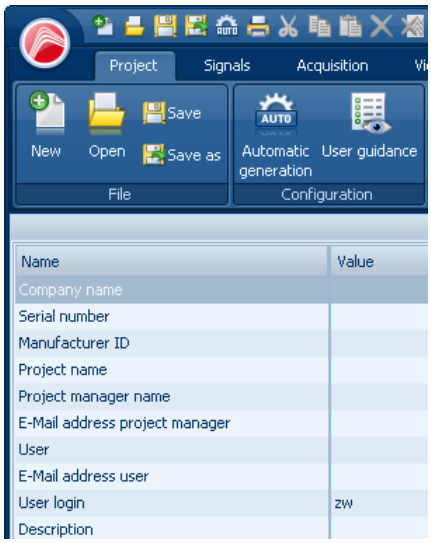
   This preselection of the system components facilitates the device selection and improves the system speed.

   Confirm with **OK**.
5. Click on the **Start displaying** button to start the displaying of the acquisition data.
6. Click in the **Acquisition** menu on the **Start storing** button to record the acquisition data.

6 Working with IPEmotion

The following chapter shows how to use the software IPEmotion for configuring the hardware modules and acquiring data, as well as, managing and analyzing the acquired data.

6.1 Project



The increasing number of units in operation and the ever increasing amount of data being captured requires an ability, which offers you a simple and flexible solution. IPEmotion provides a method, which guarantees the simple and intuitive management of all acquired data. This concept is based on the definition of relevant and significant parameters and their relationship to the **Project settings**, which are saved in an acquisition data file.

IPEmotion offers you the ability to create user-defined projects. These projects contain general parameters needed to define fundamental information for an acquisition. The project settings allow a clear, structured view and management of road tests and multiple data acquisitions. Based on these user-defined projects, data analysis and statistical reports are made possible.

The basis for defining the project settings are the two description files *projectPar.xml* and *projectData.xml*. With using those project description files and any text or HTML editor, you can define default and user-defined parameters and the corresponding values.

The project properties are controlled with the parameters of the above mentioned XML files. The input fields using the IPEmotion user interface are defined as freely editable by default.

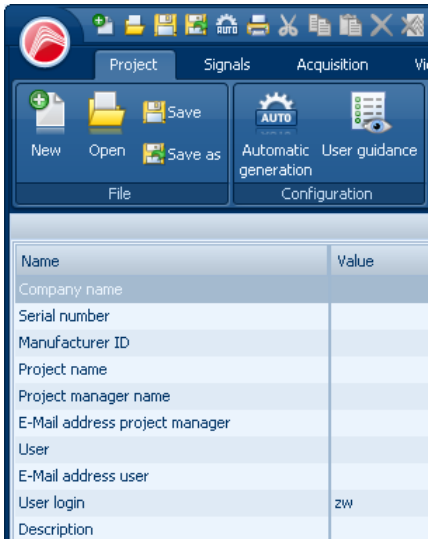
The default setting of the project properties in IPEmotion refers to the language dependent column *Name*. This column *Name* refers to the user-defined parameter descriptions and is therefore name-oriented.

Please note that using the name-oriented project settings; only the properties can be tracked within the acquisition data file.

6.1.1 Configuring project settings

In the IPEmotion user interface, under the main navigation tab *Project*, all existing project settings are shown. The overview is divided into three columns:

- Name
- Value

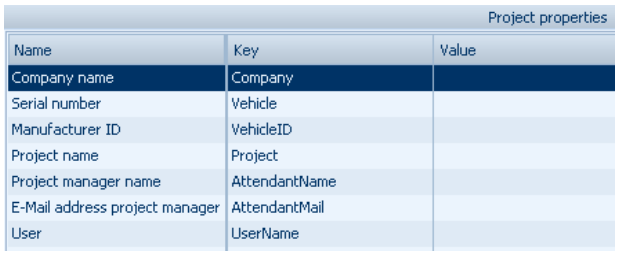


The user-specific data of the **Name** column include information about the vehicle, as well as, details from to the author of the project and the user.

The parameter **Value** allows you to add and/or edit own project-related notes and comments within the IPEmotion user interface.

With using the *Column Chooser* function, you can add the *Key* column to this overview. Click into the headline of the column and open the menu with the right mouse button. Select *Column Chooser*.

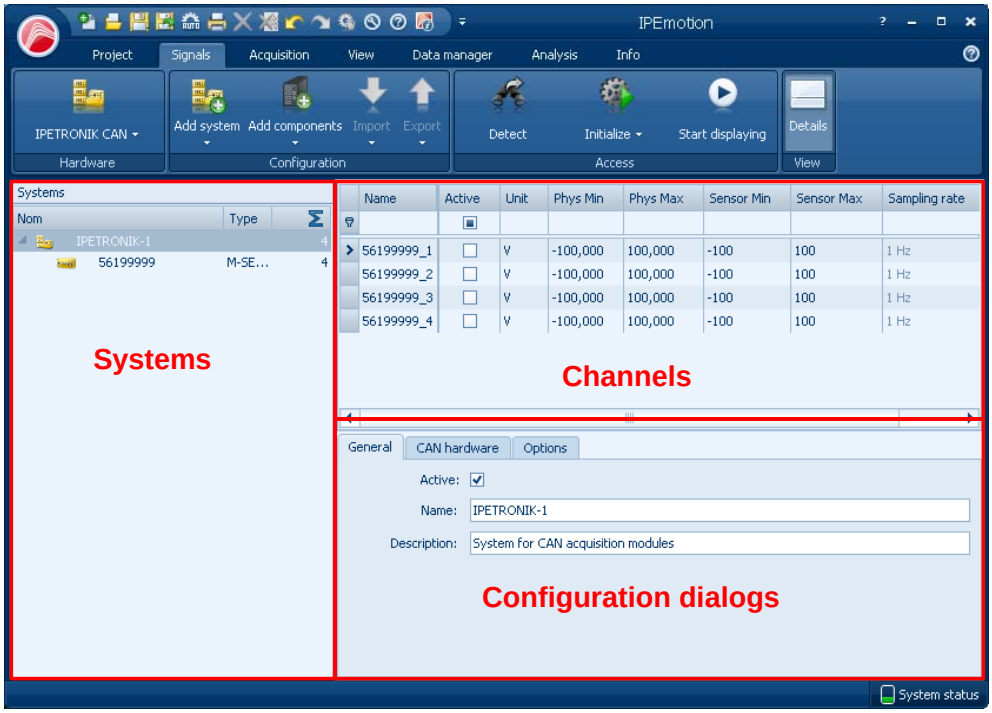
Drag the available *Key* column from the *Customization* dialog into the desired position by keeping the left mouse button pressed.



The division into the two project description files projectPar.xml and projectData.xml was required to separate the definition of the project properties from the real values. For purposes of clarity, projectPar.xml contains the definition of the project parameter and projectData.xml the corresponding values. You have the ability to automatically update those values (projectData.xml) by using a database without influencing or changing the project definition (projectPar.xml).

The parameter **Name** and **Key** can be configured and defined by using the files *projectPar.xml* and *projectData.xml*. These configuration files for the project settings can be found in the following user directory: Windows XP: C:\Documents and Settings\zw\Application data\IPETRONIK\IPEmotion Vxx.xx\ProjectTemplate; Windows 7: C:\Users\All Users\IPETRONIK\IPEmotion Vxx.xx.xx\ProjectTemplate\.

6.2 Signals



Click on the **Add system** button to select the active hardware platform. This concept allows the support of any hardware (also from third parties). Actual plugins are: IPETRONIK CAN, IPETRONIK LOG, and CAN.

The available hardware systems of the signals main navigation tab depend on the activated hardware.

Please find further information on how to activate the used hardware systems by using the IPEmotion Options in chapter 5.3.1 (PlugIns).

After the successful automatic hardware detection at starting IPEmotion, all available systems, modules, and the channels with the respective properties are listed under the main navigation tab *Signals*. The overview is divided into the following three sections:

- Systems
- Channels
- Configuration dialogs

6.2.1 Systems

The view *Systems* contains all available systems and the corresponding modules with the respective type description and channel count.

At using the **manual** configuration of the connected systems click on the button **Detect** . The hardware detection starts on the basis of the connected devices and the data is shown in the overview.

At manually creating a configuration for the **Dry configuration** proceed as follows:

1. Click on the button **Add system** and select the desired hardware.
2. Click on the button **Add component** to expand the existing system by further components and to set the respective number of the corresponding modules.

   Please note that the button is only activated if the respective system is selected in the window *Systems*!
3. Click on the button **Initialize** to initialize the hardware and to synchronize and configure the selected system on the basis of the data. At using the hardware initialization the devices are switched into the configuration mode and acquisition mode.

The data is shown in the overview. At manually adding the connected IPETRONIK CAN devices the CAN-ID starts at 10 by default and the serial number is set to 99999.

At acquiring data by using an ETHERNET cable and a data logger that was previously configured with the IPEconf 4 software, the following error message may appear:

"The logger configuration was created with IPEconf 4 and cannot be read. A logger with 2 CAN interfaces is set."

To being able to use the corresponding data logger in IPEmotion, you need to download a default configuration to the data logger. To do so, proceed as follows:

- *Click on the **New*** *button to create a new configuration.*
- *Select the data logger according to the connected hardware by using the **Add system*** *and **Add components*** *buttons.*
- *Configure the data logger:*
  - *Select the data logger in the system view and assign the **Front number** within the **Extended** tab. The front number consists of the last 4-5 digits.*
  - ***Activate** for instance a DIN **channel**.*

*Add a new **storage group** to the local storage groups and add the activated **channel**.*

*Click on the **Initialize** button to update the connected hardware with the new configuration.*

*Click on the **Detect** button and select the desired data logger.*

The data logger with the initialized configuration is shown in the IPEmotion user interface.

TEDS sensors

IPEmotion V01.09 (in combination with e.g. IPEmotion PlugIn IPETRONIK X V01.03) allows using TEDS sensors (Transducer Electronic Data Sheet).

To work with TEDS sensors, proceed as follows:

Connect the module to a Lemo 2B port (10-pin) of a suitable module.

Connecting and disconnecting of a TEDS sensor is automatically detected by IPEmotion and shown in a popup message, as well as, within the message window. The Symbol *column within the channel overview identifies the connected TEDS sensors whose data is automatically set for the channel.*

Select the **Detect** function to read out the sensor and scale with predefined data **or** the **Synchronize** function.

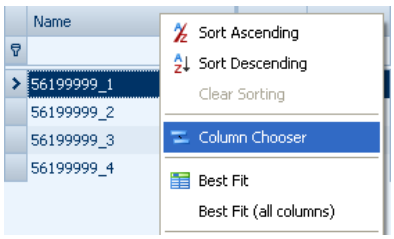
After reading out the sensor and activating the corresponding channels, you can use the tab **Scaling** -> Scaling calculator or the context menu -> **Scaling calculator** to display the sensor information. The entry mode **TEDS Sensor** is automatically selected.

6.2.2 Channels

The view *Channels* contains all available channels of the device selected in the tree list of the systems section.

With the **Column Chooser** function, IPEmotion offers you the ability to use your own user-defined columns. To do so, proceed as follows:

1. Click into the headline of the column and open the menu with the right mouse button.
2. Select *Column Chooser*.
3. Drag the desired columns into the view window by keeping the left mouse button pressed.



6.2.3 Configuration dialogs

The view *Configuration dialogs* contains all configuration possibilities of the systems or device selected in the tree list of the systems section.

The shown configuration tabs are based on the selected system or device and channel. For a **system** you can for example define the following settings:

- General
- CAN hardware
- Options

For a **device** you can for example set the following options:

- General
- Extended
- Information

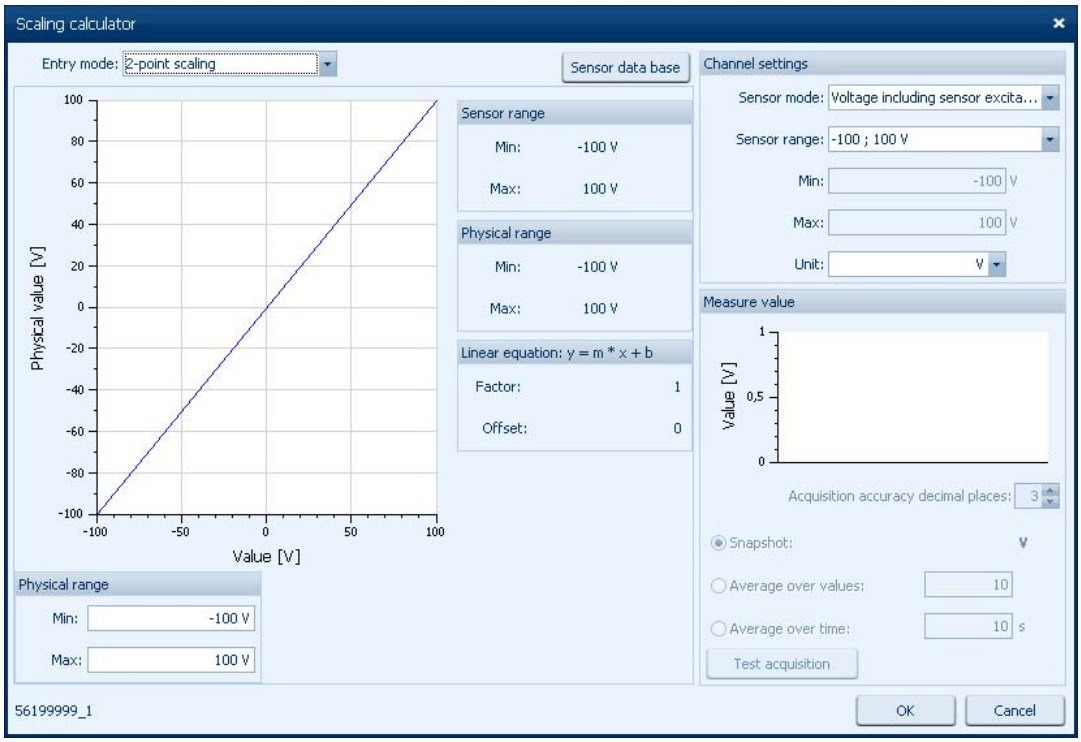
The options for a **channel** are based on the selected device. You can for example define the following settings:

- General
- Format
- Scaling
- Display
- Offset
- Sensor
- Filter
- Adjust

*For working with data loggers, IPEmotion offers you the ability to define the limit values of an acquisition. There are visual and auditory signals for controlling the limits available. Define the settings by using the Limit value tab. Clicking in the **Min-Max List** selection box, you activate the creation of a *.STG file where the global minima and maxima of the corresponding channels are stored.*

6.2.4 Using the scaling calculator

IPEmotion offers you the ability to define the sensor range and acquisition mode of a channel by using the scaling calculator. Calculate the physical range and the acquisition range of your data.



A precondition for using the scaling calculator is the selection of channels in your configuration. Start the scaling calculator by using the corresponding button within the **Scaling** tab .

The scaling calculator offers you the following four input modes:

- 2-point scaling
- Free 2-point scaling
- Factor/Offset scaling
- Multipoint scaling
- STG
- Active/Passive sensors
- TEDS Sensor

The section *Channel settings* offers you to define the physical unit of the channel.

2-point scaling

The acquisition range is already set by the channel properties. Define the physical range.

Free 2-point scaling

In addition, define the ordinates in the acquisition range.

Factor/Offset scaling

Define the calculating and scaling factors within the linear equation.

Multipoint scaling

Define individual nodes for nonlinear sensor scaling with the respectively assigned physical values. The nodes can be entered manually or the current measurement value can be requested from the device for every node.

- Use the * character to add or delete a node within the overview **Physical value** and **Acquisition value**. To accept the acquisition value, a previous **test acquisition** is required. The **Apply measured value** button is then activated.

The multipoint scaling is only supported for acquisitions directly in IPEmotion.

STG

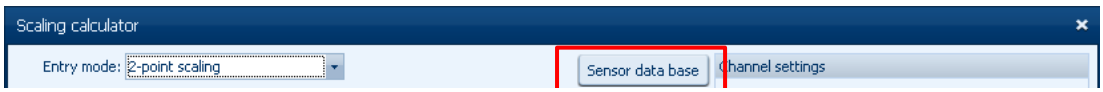
Define your STG values for STG capable channel types to start an automatic calculation of the acquisition range with additional strain conversion. You can additionnally check your configured STG bridge.

- Click on the **Calculate optimal shunt resistance** button or the **Shuntcheck** button to run an acquisition. This result is compared to the precalculated expected value. If the resulting value differs considerably from the expected value, which has been defined by a tolerance level, a corresponding warning is displayed.

TEDS Sensor

Use the TEDS sensors (Transducer Electronic Data Sheet) for automatic detection and configuration of data acquisition systems (see TEDS sensors).

6.2.5 Using the sensor data base



The sensor data base in IPEmotion offers information about any count of sensors. For example, the following relevant data of a sensor are saved:

- Name
- Type

- Acquisition range
- Scaling and linearization information
- Adjusting date

It is embedded into the scaling calculator for allowing a quick configuration of known sensors.

The sensor data base can contain various information of a sensor. Two different application cases may be distinguished for the specification of the data to be saved in principle:

- only the sensor type in the data base is described
- a special sensor in the data base is described

In the first case, the sensor data base only includes basic information about the sensor types and the following descriptions for instance are not saved in the data base:

- Calibration date
- Serial number
- Storage location

This model requires only a few descriptions and does not force the possibility to change data in the data base. The first case is recommended for working with a small number of sensors and if no fixed assignations of single sensors to application areas are set. A special advantage is the considerably shorter list of sensors in the data base, as well as, the unique assignation of a sensor to a data base entry via the sensor type.

By contrast, the second case also includes the storage of data, which are not specified in the first case. Therefore, the data base can contain any number of sensors of the same type, which for instance only differ in the serial number. The second model is recommended for working with bigger systems with fixed assignations – in spite of the higher maintenance requirements (changes at the sensors like entering the calibration date into the data base.)

The IPETRONIK sensor data base is separated into two linked data base tables. This concept allows the access to the general data of a sensor type, as well as, to the data of a specific sensor from the data base. The first table includes all constant data of a sensor type. The second table includes all data of a specific sensor. They additionally include a reference at the sensor type, which belongs to the sensor. The second table is primarily used if single sensors with scaling and linearization information should be stored in the sensor data base.

The table 1 includes for example the following data:

- Sensor type (Name)
- Sensor model
- Manufacturer
- Type of the output signal (Excitation, Current, Frequency,…)

- Physical unit
- Minimum / Maximum physical value
- Output unit (Excitation/Current/Frequency/…)
- Minimal / Maximal output excitation/current/frequency/…
- Supply excitation (nominal)
- Excitation minimal / maximal
- Sensitivity
- Bridge resistance
- k-factor
- Bridge factor
- Poisson's ratio
- Maximal current

The table 2 includes for example the following data:

- Serial number
- Calibration date

Additional information about the single sensors can be stored by using a user-defined list in the XML format. This type of information includes for example the sensor precision, overload limit, sensor type and the working temperature range. Please note that these data do not flow into the scaling calculation.

The data base format

The sensor data base in the IPEmotion version was created in the XML format. At the installation of IPEmotion, the IPESensorDatabase file is stored in the following directory: Windows XP: C:\Documents and Settings\UserApplication data\IPETRONIK\IPEmotion Vxx.xx\Database; Windows 7: C:\ProgramData\IPETRONIK\IPEmotion Vxx.xx.xx\Database.

the following extract shows the structure of the data base:

```
<?xml version="1.0" encoding="utf-8"?>
<SensorDatabase version="1">
  <!-- GIGATRONIK -->
  <Sensor name="GTF20midi">
    <sensorName type="String">GTF20midi</sensorName>
```

```
<sensorTypeId type="Int32">3</sensorTypeId>
<sensorType type="String">Shunt</sensorType>
<sensorManufacturer type="String">GIGATRONIK</sensorManufacturer>
<physicalUnitName type="String">A</physicalUnitName>
<physicalMin type="Double">0</physicalMin>
<physicalMax type="Double">20</physicalMax>
<outputUnitName type="String">V</outputUnitName>
<outputMin type="Double">0</outputMin>
<outputMax type="Double">2</outputMax>
<UserProperties>
 <UserProperty>
  <propertyName type="String">Working temperature range</propertyName>
  <propertyValue type="String">-40 … +85 °C</propertyValue>
 </UserProperty>
 <UserProperty>
  <propertyName type="String">Precision</propertyName>
  <propertyValue type="String">± 1%</propertyValue>
 </UserProperty>
</UserProperties>
<SpecificSensors>
 <SpecificSensor>
  <serialNumber type="String"></serialNumber>
 </SpecificSensor>
 <SpecificSensor>
  <serialNumber type="String">SN #1</serialNumber>
  <calibrationDate type="Date">2007-10-01</calibrationDate>
  <CalibrationValidDuration>
   <calibrationValidYears type="Int32">0</calibrationValidYears>
   <calibrationValidMonths type="Int32">6</calibrationValidMonths>
   <calibrationValidDays type="Int32">10</calibrationValidDays>
  </CalibrationValidDuration>
  <physicalMin type="Double">0.1</physicalMin>
  <physicalMax type="Double">19.8</physicalMax>
  <outputMin type="Double">0.01</outputMin>
  <outputMax type="Double">1.98</outputMax>
 </SpecificSensor>
```

The sensor names (“sensorName”) must be unique!

The current version of the sensor data base includes the following defined values for the “sensorTypeId” entry:

```
UNKNOWN = 0,
DisplacementTransducer = 1,          // Displacement transducer
LoadCell = 2,                        // Load cell
Shunt = 3,                           // Shunt
CurrentTransformer = 4,              // Current transformer
VoltageTransformer = 5,              // Voltage transformer
ForceTransducer = 6,                 // Force transducer
PressureTransmitter = 7,             // Pressure transmitter
AbsolutePressureTransmitter = 8,     // Absolute pressure transmitter
GaugePressureTransmitter = 9,        // Gauge pressure transmitter
DifferentialPressureTransmitter = 10, // Differential pressure transmitter
FlowRateTurbine = 11,                // Flow rate turbine
PistonFlowmeter = 12,                // Piston flow meter
ScrewFlowmeter = 13,                 // Screw flow meter
VortexSheddingDevice = 14,           // Vortex shedding device
Accelerometer = 15,                  // Accelerometer
TriAxialAccelerometer = 16,          // Triaxial accelerometer
TorqueMeter = 17,                    // Torque meter
Counter = 18,                        // Counter
StrainGauge = 19,                    // STG
LVDT = 20,                           // LVDT
StrainGaugeBridge = 21,              // STG bridges (Strain)
TemperatureSensor = 22,              // Temperature sensor
```

If non of the predefined types meets your requirements, you can add user-defined types to the sensor data base. The “sensorTypeId“ value must be set to 0. A short description text should classify the corresponding sensor.

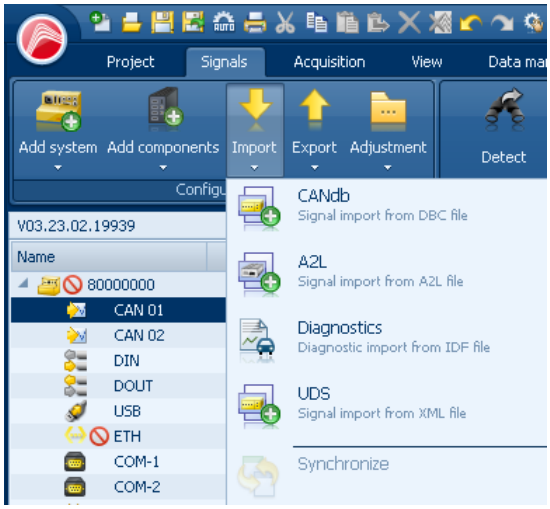
If you want to use several exemplars of a sensor within the sensor data base, use the “SpecificSensors” entry. Each of the sensors must get an unique serial number (“serialNumber”). In addition, each of these exemplars can get a calibration date (“calibrationDate”), as well as, a period of validity of the calibration (“CalibrationValidDuration”) including the data “calibrationnValidYears”, “calibrationValidMonths”, and “calibrationValidDays”. Furthermore, the values for "physicalMin", "physicalMax", "outputMin", and "outputMax", which can be found in the data sheet, can be overwritten by values, which are read at the calibration.

You can add non-relevant information for the functionality of the sensor data base like the working temperature range under the “UserProperties” entry. These are Key/Value pairs, which are used for displaying the information. Please note that these data are not used in any calculation.

6.2.6 The Import function

The import functionality in IPEmotion offers you the ability to import one or several signals and to assign a sampling rate. The proceeding configuration takes place after the import in IPEmotion.

The **Synchronize** button allows to adjust the current description file with a newer version of this file. Activate the **Show differences** option to display potential deviations of both files.



CANdb, A2L, UDS

Using the *Import* function in IPEmotion, you have the ability to read description files for the configuration of an acquisition. By doing so, control unit description files for example are imported with the A2L format and vehicle data like air conditioning or seat adjusting with the CANdb format.

To use the *Import* function in IPEmotion, proceed as follows:

- Using the **Signals** main navigation tab, select the hardware with the desired port, e.g. CAN, LIN, FlexRay.

- Select the input and click on the button **Import** . Select importing from the desired file, e.g. **CANdb** , **A2L** , **UDS** .

  The dialog window **Open file** will be initialized.

- Select from the dialog window **Open file** the desired description file (*.dbc/*.ldf/*.a2l/*.xml) with the channels to be imported. If the description file includes several protocols, please select the desired one.

- Using the **Open** button, the description file will be imported and all included channels are listed in the left overview of the dialog window **CANdb import**/**A2L import**/**UDS import**.

- Select the desired channels or click **Select all**. Confirm the selected signals using the **OK** button. Following the progress bar, the imported channels are listed in IPEmotion.

DAQ lists

The A2L import dialog offers you the ability to import protocols including DAQ lists (e.g. CCP, XCP). You can assign preferred sampling rates to your signals. Please note that the selection of the sampling rate and the corresponding DAQ list is subjected to the following conditions and definitions:

- The signal is assigned to the corresponding DAQ list depending on the selected sampling rate, whereas time-synchronized DAQ lists are defined with a higher priority than angular-synchronized DAQ lists.

- If no DAQ list with the desired sampling rate is available, a DAQ list with higher sampling rate is used.
- If the selected sampling rate is higher than all offered sampling rates of the available DAQ lists, the fastest DAQ list is used.
- If no DAQ list is defined, the Polling DAQ list is used.

You can also explicitly assign the signals to a single DAQ list. To do so, show the DAQ list column within the import dialog. This mode allows to directly assign the DAQ list to be used to the signals. Proceed as follows:

- Select the **Column Chooser** entry within the A2L import dialog from the context menu of the column heading.
- Drop the **DAQ list** entry from the Customization dialog to the desired position within the column heading. This action automatically removes the *Sampling rate* column.

If you want to activate more signals than available in a DAQ list, the overfilling is indicated as a warning in the view tree. At overfilling a DAQ list, the corresponding signals are automatically deactivated after import. IPEmotion offers you the ability to check the filling level of the DAQ lists.

- Open the context menu of the desired DAQ list in the tree view and open the **Import properties** entry.

  The import properties show an overview about e.g. the percentage filling level or the number of free signals for a specific data type. If the DAQ list is overfilled, the number of signals to be removed is indicated with a negative figure.

Please note that the import properties are only available with the **Expert mode**! Activate this mode within *IPEmotion options* *-> Basic settings -> Expert mode*.

Diagnosis

Using the function *Import* in IPEmotion, you have the possibility to read description files for the configuration of an acquisition. Import all control units description files from the file format *.idf. This file is based on the description language XML and contains additionally to the control unit information the diagnostic jobs to be run. You define the job sequences of a specific control unit (ECU). The job sequences are a group of single jobs (services) and their defined order.

To use the function *Import* for diagnostic jobs in IPEmotion, proceed as follows:

- Using the **Signals** main navigation tab, select the hardware with a CAN port.
- Select the CAN input and click on the button **Import** . Select importing from a **Diagnostics** file .

  The dialog window **Open file** will be initialized.
- Select from the dialog window **Open file** the desired description file (*.idf) with the job sequences to be imported.

- Using the **OK** button, the file will be imported and all included job sequences are listed in the channel overview in IPEmotion.

6.2.7 Configuration with signal database

The use of signal databases allows a signal oriented configuration. IPEmotion offers you the ability to load a signal database from user-defined files or databases.

If you have an own **signal database** available, you can import it to IPEmotion and select your signals. To access a specific signal database in IPEmotion the signal database must be converted to an IPEmotion file format. The conversion can be done with an external program. These user-defined programs are easily generated on request and offer the ability to import signal channels into IPEmotion.

The signals of a database are assigned to signal groups and signals, in which the affiliation of signals to a signal group decides about the possibility of using several signals on one remote device.

The order of the found hardware is sorted according to the fitness for use. IPEmotion sorts the hardware in descending order accordingly to their fitness.

The following criteria are considered for sorting the hardware accordingly to the importance:

- Sensor mode
- Sensor range (differential consideration)
- Priority

IPEmotion offers the possibility to influence the order. The available hardware components are based on the assigned priority of the system settings within the IPEmotion → PlugIns → Settings. This preselection of the system components facilitates the device selection and improves the system speed.

First of all, you have to define the basic setting of IPEmotion to use the configuration with signals. Click on **Options** or open the dialog window **IPEmotion Options** by using the **application menu** and the **Options** function. In the **Basic settings** section select the configuration type **Signals configuration** and the desired signal database (*.mpc). Confirm with the **OK** button.

To create a configuration with a signal database proceed as follows:

1. In the **Signals** menu click in the window **Signals**.
2. Under the point **Signals** click on the **Import** button and select the **Signal import**.
3. Open the desired signal database (*.mpc) and select the desired **signals** by using a filter or multiple selections. Assign the signals with Drag&Drop or by using the arrow buttons.
4. Select the desired hardware in the Components column. Confirm with **OK**.
5. Click on the **Start displaying** button to start the displaying of the acquisition data.
6. Click in the **Acquisition** menu on the **Start storing** button to record the acquisition data.

Structure of a signal database

Files for signal databases are XML files (*.mpc). The schema file Mpc.xsd is available for validating MPC files and is installed in the following directory: Windows XP: C:\Documents and Settings\User\Application data\IPETRONIK\IPEmotion Vxx.xx.xx\template; Windows 7: C:\Users\All Users\IPETRONIK\IPEmotion Vxx.xx.xx\template.

A signal contains the following parameters:

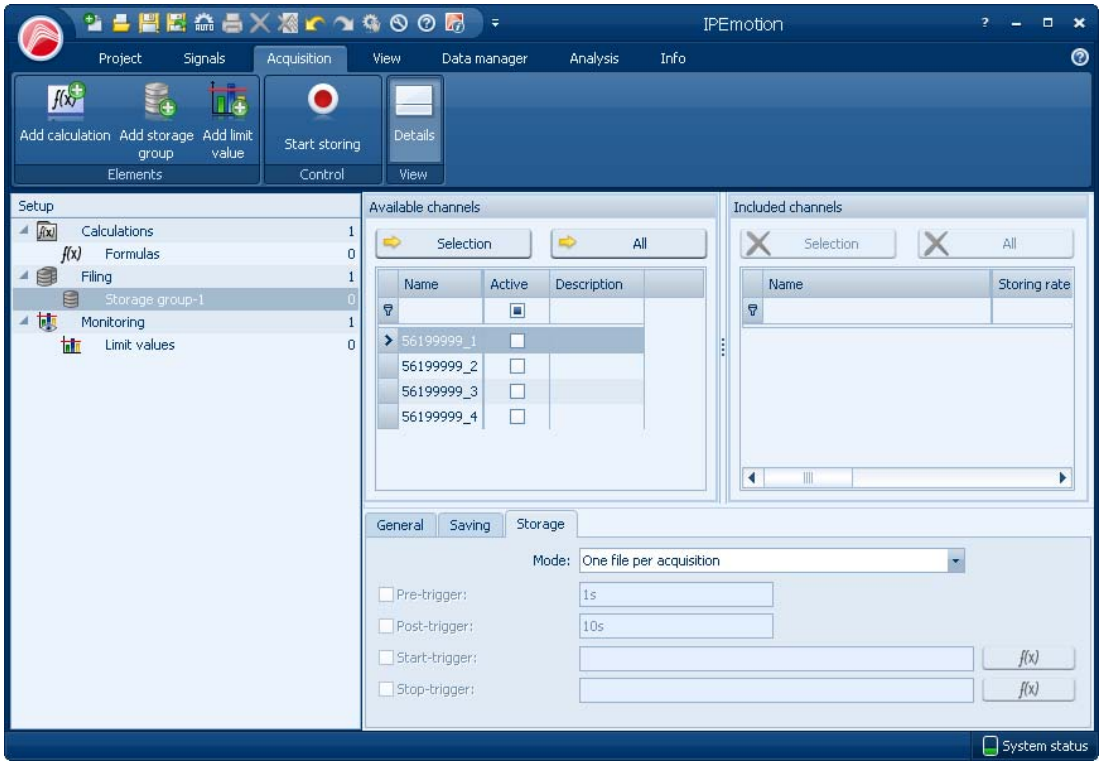
Name	Type	Description
group	string	Signal group
point	string	Signal
sensorMode	uint32	Sensor mode (see following table)
sensorMin	double	Min limit of the sensor range
sensorMax	double	Max limit of the sensor range
sensorUnit	string	Sensor unit for elements with the sensor mode “undefined”
sampleRate	double	Sampling rate in Hz (optional)

The following sensor modes are currently available:

Name	Value	Description
NoUnit	0x00000000	Signal without unit
Status	0x00010000	Status signal
EventCounter	0x00020000	Event counter
Length	0x00000001	Length
Mass	0x00000002	Mass
Time	0x00000003	Time
PeriodicDuration	0x00010003	Periodic duration
PulseDuration	0x00020003	Pulse duration
PauseDuration	0x00030003	Pause duration
TimingOffset	0x00040003	Time offset
Current	0x00000004	Current
CurrentWithSens	0x00010004	Current including sensor excitation
Temperature	0x00000005	Temperature
Thermocouple	0x00010005	Thermocouple
Pt100	0x00020005	PT-100
Pt200	0x00030005	PT-200
Pt1000	0x00040005	PT-1000
MolarAmount	0x00000006	

LuminousIntensity	0x00000007
Voltage	0x00000008
Sens	0x00010008
Stg	0x00020008
Icp	0x00030008
Resistance	0x00000009
Frequency	0x0000000A
FrequencyFromPeriod	0x0001000A
Force	0x0000000B
Energy	0x0000000C
Power	0x0000000D
Pressure	0x0000000E
Speed	0x0000000F
Rpm	0x00000010
MassFlowRate	0x00000011
Angle	0x00000012
Strain	0x00000013
BaudRate	0x00000014
Percent	0x00000015
DutyCycle	0x00010015
ByteSpace	0x00000016
Undefined	-1

6.3 Acquisition



In the **Acquisition** main navigation tab all available channels are shown. You can configure calculations and create storage groups.

If a storage group contains channels with only one storing rate, i.e. all channels have the same storing rate, one time channel is created for all channels of the storage group.

If a storage group contains channels with different storing rates, one time channel is created for each channel of the storage group.

IPEmotion offers the ability to save the acquired data in different formats.

- Create a storage group and add the desired channels to the *Included channels* overview.
- Select in the **Saving** tab of the configuration dialogs the desired format.
- Create another storage group and repeat the above steps.

Please note the maximum file size of approx. 454 MB. If this file size is reached, the corresponding file is closed and a new file is created. An ascending index counting is used for describing the generated files.

The Drag&Drop function or the *Selection* or *All* buttons from the view *Available channels* can be used to display the desired channels in the view *Included channels*.

Define how to measure and store the configured channels (e.g. triggered, continuously and in which storage group). To do so, use the setting possibility **Storage** within the configuration dialogs.

To acquire data, the acquisition storage has to be started and stopped manually or triggered to start.

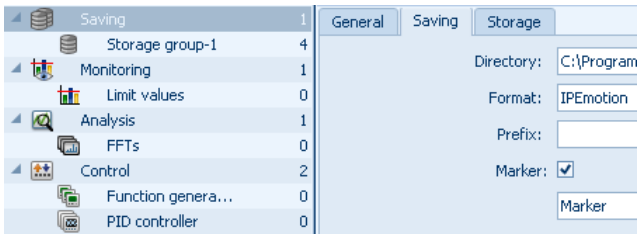
A potential PC overload can result in a stop of displaying the data. But the recording and saving of the data continues. Due to the fact that an acquisition has the highest priority, it can be ensured that the data transfer is sustained and no data is lost.

6.3.1 Saving

IPEmotion offers the ability to configure important dates in the measurement files by using markers. Optional texts can also be defined.

- Select the **Acquisition** main navigation tab and the **Saving** entry within the tree view.

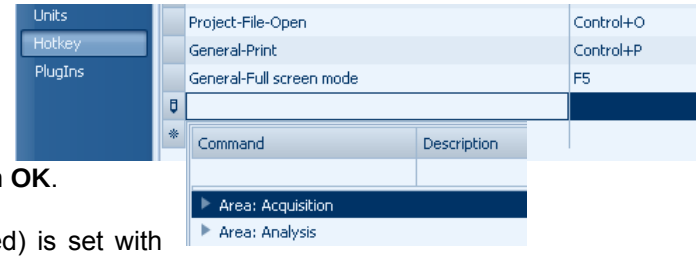
- Subsequently select the **Saving** tab in the configuration dialogs and activate the **Marker** function. You can define a name for this marker. If a marker is activated, it is automatically added to the list of the channels to be stored.



You can additionally assign a hotkey for a marker.

- Open the **IPEmotion options** and the **Hotkey** entry.

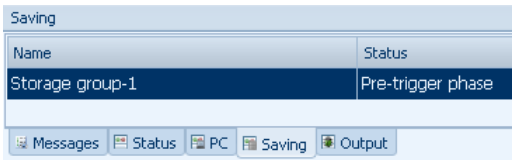
- Open the **Area: Acquisition** entry and double-click on **Acquisition-Storage group-Marker**. Assign a hotkey for this new command. Select the corresponding marker in the **Entry** column. Confirm your configuration with **OK**.



At using the hotkey, the text (if defined) is set with the time stamp. If the associated storage group is stored at the same time, the date is also saved for this process.

Storage group

IPEmotion offers you the ability to track the current status of a storage group. Depending on your configuration of the storage mode (*Storage* configuration tab), the current status is shown within the Saving window.



The following modes are currently available:

- Offline, Pre-trigger phase, Storage, Waiting for trigger

6.3.2 Formula editor

The formula editor allows a simple use and displaying of mathematic and physical functions and formulas. The following chapter shows entry examples of the available functions and formulas.

The calculation results are automatically written into the formula channel (result channel) at using the formula editor.

Function	Example	Editor entry
Addition	Value1 + Value2 = Result1	“Temp_1“+”Temp_2”
Subtraction	Value1 - Value2 = Result1	“Temp_1“-”Temp_2”
Multiplication	Value1 * Value2 = Result1	“Temp_1“*”Temp_2”
Division	Value1 / Value2 = Result1	“Temp_1“/”Temp_2”
MOD	17 mod 3 = 2	"Sens_channel1"MOD"Sens_channel2"
- The modulo function (remainder) shows the remainder of a division of two integers.		
ABS	ABS (-17) = 17	ABS("SENS_channel3")
- The amount function converts a negative value into a positive one.		
SIGN	Sign (-3786) return value: -1	SIGN("DMS_channel8") or SIGN("Temp_1"-"Temp_2")
- The SIGN function returns the sign of the numeric term, which is written in brackets. Depending on the read number, the function returns the values as follows: • At negative numbers, SIGN returns –1. • At positive numbers, SIGN returns 1. • At zero, SIGN returns 0.		
Equal	Temp_1 = 70	“Temp_1”=70
- The operator compares the values on the left and right side of the equal sign. The return value is 1 in compliance, otherwise 0.		
Unequal	Temp_1 <> 70 return value 1	"Temp_1"<>70
- Value1 is compared with value2. If the values do not comply, the return value is 1, otherwise 0.		
Greater than	3000 > 2 return value 1; 200 > 4000 return value 0	"Temp_1">"Temp_2"

- The value1 left to the sign is compared with the value2 right to the sign. If value1 is greater than value2, the return value is 1.		
Less than	3000 < 2 return value 0; 200 < 4000 return value 1	"Temp_1"<"Temp_2"
- The value1 left to the sign is compared with the value2 right to the sign. If value1 is less than value2, the return value is 1.		
Greater equal	30 >= 5 return value 1; 40 >= 50 return value 0	"Temp_1">="Temp_2"
- The value1 left to the sign is compared with the value2 right to the sign. If value1 is greater than or equal to value2, the return value is 1.		
Less equal	30 <= 5 return value 0; 50 <= 50 return value 1	"Temp_1"<="Temp_2"
- The value1 left to the sign is compared with the value2 right to the sign. If value1 is less than or equal to value2, the return value is 1.		
PREV	Prev(Thermo_channel2)	PREV(“Thermo_channel2”)
- The PREV function allows the displaying of prior measuring values. After having selected the channels, the values of the previous cycle are shown (n=n-1).		
SIN(), COS(), TAN(), SINH(), COSH(), TANH(), ASIN(), ACOS(), ATAN()		
- All trigonometric functions are calculated in radians (0 … 2*Pi). At invalid values, NoValue/invalid is written into the result channel.		
NOT	Signal A = 0, Output = 1; Signal A = 1, Output = 0	NOT("Status_1")
- The output inverts the logical status of the input. Status of previous logical channels can also be inverted.		
AND		"Signal A"AND"Signal B"
- At least two channels are compared.		
OR		"Signal A"OR"Signal B"
- At least two channels are compared.		
XOR		"Signal A"XOR"Signal B"
- At least two channels are compared. In contrast to Or, only one input can have the logical status 1 for getting a logical 1 at the output.		

EXP		EXP("Channel")
- At invalid values of the exponential function, NoValue/invalid is written into the result channel.		
LOG		LOG("Channel")
- At invalid values of the logarithm function, NoValue/invalid is written into the result channel.		
LN		LN("Channel")
- At invalid values of the natural logarithm function, NoValue/invalid is written into the result channel.		
SQRT		SQRT("Channel")
- At invalid values of the square root function, NoValue/invalid is written into the result channel.		
Tendency displaying		SIGN("Temp_1"-(PREV("Temp_1")))
- The result is 1 at rising temperature and –1 at decreasing temperature.		
Gliding averaging of the last 5 values		MEAN("Temp_1"; 5)
Logical connection of several channels		(("Temp_1"+"Temp_2")>60)AND(("Temp_3"+"Temp_4")>50)

Operators

This section shows the currently available operators and their syntax and behavior referring to NoValues.

A formula is parsed case-sensitively.

Operator	Description	Syntax	NaN
+	Addition of two operands	Op1 + Op2	(Op1 == NaN) || (Op2 == NaN)
-	Subtraction of two operands	Op1 – Op2	(Op1 == NaN) || (Op2 == NaN)
*	Multiplication of two operands	Op1 * Op2	(Op1 == NaN) || (Op2 == NaN)

/	Division of two operands	Op1 / Op2	(Op1 == NaN) || (Op2 == NaN) || (Op2 == 0.0)
^	Potentiation of two operands	Op1 ^ Op2	(Op1 == NaN) || (Op2 == NaN)
=	Analysis of two operands for equality	Op1 = Op2	(Op1 == NaN) || (Op2 == NaN)
!= <>	Analysis of two operands for inequality	Op1 != Op2	(Op1 == NaN) || (Op2 == NaN)
<	Analysis of two operands for less	Op1 < Op2	(Op1 == NaN) || (Op2 == NaN)
<=	Analysis of two operands for less or equal	Op1 <= Op2	(Op1 == NaN) || (Op2 == NaN)
>	Analysis of two operands for greater	Op1 > Op2	(Op1 == NaN) || (Op2 == NaN)
>=	Analysis of two operands for greater or equal	Op1 >= Op2	(Op1 == NaN) || (Op2 == NaN)
ABS	Absolute value	ABS(Op1)	(Op1 == NaN)
ACOS	Arcus cosine	ACOS(Op1)	(Op1 == NaN)
AND	Logical And operator (&&)	Op1 AND Op2	(Op1 == NaN) || (Op2 == NaN)
ANDB	Bitwise And operator (&)	Op1 ANDB Op2	(Op1 == NaN) || (Op2 == NaN)
ASIN	Arcus sinus	ASIN(Op1)	(Op1 == NaN)
ATAN	Arcus tangent	ATAN(Op1)	(Op1 == NaN)
CEIL	Sends the less integer value, which is greater than or equal to the value of Op1.	CEIL(Op1)	(Op1 == NaN)
COS	Cosine function	COS(Op1)	(Op1 == NaN)
COSH	Cosine Hyperbolicus	COSH(Op1)	(Op1 == NaN)
DIFF	(Op1(t) – Op1(t-1)) / DeltaT	DIFF(Op1)	(Op1 == NaN)
EDGE_NEG	Detection of negative edges of Op1.	EDGE_NEG(Op1)	(Op1 == NaN)
EDGE_POS	Detection of positive edges of Op1.	EDGE_POS(Op1)	(Op1 == NaN)
EXP	Exponential function	EXP(Op1)	(Op1 == NaN)

FLOOR	Sends the greatest integer value, which is less than or equal to the value of Op1.	FLOOR(Op1)	(Op1 == NaN)
IF	Ramification	IF(Op1; Op2; Op3)	(Op1 == NaN) || (Op2 == NaN) || (Op3 == NaN)
INT	((Op1(t) + Op1(t-1) / 2) * DeltaT	INT(Op1)	(Op1 == NaN)
INT_UP	Op1 * DeltaT	INT_UP(Op1)	(Op1 == NaN)
LIN	Linearization with nodes	LIN(Op1; Ip1; Ip2; Ip3; Ip4;…)	(Op1 == NaN)
LN	Logarithm naturalis	LN(Op1)	(Op1 == NaN) || (Op1 <= 0.0)
LOG	Logarithm function	LOG(Op)	(Op1 == NaN) || (Op1 <= 0.0)
MAJOR	Sends the greater value of both operands.	MAJOR(Op1; Op2)	(Op1 == NaN) || (Op2 == NaN)
MAX	Maximum of all valid values	MAX(Op1)	(Op1 == NaN)
MEAN	Average of all valid values. At ip1 > 0 happens an averaging of the last Ip1 values. If Ip1 is not defined or 0, all valid values are averaged.	MEAN(Op1; Ip1)	(Op1 == NaN)
MIN	Minimum of all valid values	MIN(Op1)	(Op1 == NaN)
MINOR	Sends the less value of both operands.	MINOR(Op1; Op2)	(Op1 == NaN) || (Op2 == NaN)
MOD	Floating point rest	Op1 MOD Op2	(Op1 == NaN) || (Op2 == NaN) || (Op2 == 0.0)
NEG	Negation	NEG(Op1)	(Op1 == NaN)
NOT	Check value for 0 (!-Operator) Op1 <> 0.0 -> 0.0 Op1 = 0.0 -> 1.0	NOT(Op1)	(Op1 == NaN)
NOTB	Bitwise Not operator	NOTB(Op1)	(Op1 == NaN)
OR	Logical Or operator (||)	Op1 OR Op2	(Op1 == NaN) || (Op2 == NaN)
ORB	Bitwise Or operator (|)	Op1 ORB Op2	(Op1 == NaN) || (Op2 == NaN)
PREV	Use of previous value	PREV(Op1)	(Op1 == NaN)
ROUND	Rounds the value of Op1 to the next	ROUND(Op1)	(Op1 == NaN)

	integer value.		
SHL	Left shift	Op1 << Op2	(Op1 == NaN) || (Op2 == NaN)
SHR	Right shift	Op1 >> Op2	(Op1 == NaN) || (Op2 == NaN)
SIGN	Sign detection Op1 < 0.0 -> -1.0 Op1 = 0.0 -> 0.0 Op1 > 0.0 -> 1.0	SIGN(Op1)	(Op1 == NaN)
SIN	Sinus function	SIN(Op1)	(Op1 == NaN)
SINH	Sinus Hyperbolicus	SINH(Op1)	(Op1 == NaN)
SQRT	Square root	SQRT(Op1)	(Op1 == NaN) || (Op1 < 0.0)
TAN	Tangent function	TAN(Op1)	(Op1 == NaN)
TANH	Tangent Hyperbolicus	TANH(Op1)	(Op1 == NaN)
TESTBIT	Check Op2 bit of Op1 for 1, Op2 starts with 0	TESTBIT(Op1; Op2)	(Op1 == NaN) || (Op2 == NaN)
TESTMASK	Check Op1 value with And mask 0xFFFFFFFF for unequal 0.	TESTMASK(Op1)	(Op1 == NaN)
TESTMASKS	Check Op1 value with And mask Op2 for unequal 0.	TESTMASKS(Op1; Op2)	(Op1 == NaN) || (Op2 == NaN)
TIME	Time counter, which is reset at a Op1 value < 1.	TIME(Op1)	(Op1 == NaN)
TIMER	Time emitter, which sends 1 if Op1 is not changed within Op2 seconds, otherwise 0.	TIMER(Op1; Op2)	(Op1 == NaN) || (Op2 == NaN)
VALID	Check Op1 value for validity Op1 <> NaN -> 1.0 Op1 = NaN -> 0.0	VALID(Op1)	
VALID	Check Op1 value for validity. If Op1 value is invalid, Op2 is sent back, otherwise the Op1 value.	VALID(Op1; Op2)	(Op1 == NaN) && (Op2 == NaN)
XOR	Logical Exclusive-Or operator	Op1 ^ Op2	(Op1 == NaN) || (Op2 == NaN)
XORB	Bitwise Exclusive-Or operator	Op1 XOR Op2	(Op1 == NaN) || (Op2 == NaN)

AND

Corresponds to the logical And operator. If both partial conditions are met, value 1 is sent, otherwise 0.

Syntax

Operand1 AND Operand2

Examples

(2.4 > 1.2) AND (21.3<34.1) => 1

(2.4 < 1.2) AND (21.3<34.1) => 0

(2.4 > 1.2) AND (21.3=34.1) => 0

(2.4 < 1.2) AND (21.3=34.1) => 0

ANDB

Corresponds to the bitwise And operator. All bits, which are set in Operand1 and 2, are also set in the result; all other bits result in 0.

Syntax

Operand1 ANDB Operand2

Examples

27 ANDB 12 => 8

27 ANDB 13 => 9

27 ANDB 4 => 0

CEIL

Rounds a floating point number up to the next greater integer.

Syntax

CEIL(Operand)

Examples

CEIL(13.53) => 14.0

CEIL(2.41) => 3.0

DIFF

Differentiates the operator with the calculation formula "(Op1(t) – Op1(t-1)) / DeltaT".

Syntax

DIFF(Operand)

Examples

DIFF(“Channel 1“) sends the differential of the current and last value of “Channel 1”.

EDGE_NEG

If the operator value is a negative edge, the result is 1.0, otherwise 0.0.

Syntax

EDGE_NEG(Operand)

Examples

EDGE_NEG(“Channel 1“) sends 1.0 if "Channel 1" changes from 1 to 0, otherwise the result is 0.0.

EDGE_POS

If the operator value is a positive edge, the result is 1.0, otherwise 0.0.

Syntax

EDGE_POS(Operand)

Examples

EDGE_POS(“Channel 1“) sends 1.0 if "Channel 1" changes from 0 auf 1, otherwise the result is 0.0.

FLOOR

Rounds a floating point number off to the next smaller integer.

Syntax

FLOOR(Operand)

Examples

FLOOR(13.53) => 13.0

FLOOR(2.41) => 2.0

IF

Runs a ramification operation. If the condition of Operand1 is met, the value of Operand2 is sent, otherwise the value of Operand3.

Syntax

IF(Operand1; Operand2; Operand3)

Examples

IF (3>2;4;5) => 4

IF (3<2;4;5) => 5

INT

Calculates the operator's integral with the calculation formula "((Op1(t) + Op1(t-1) / 2) * DeltaT".

Syntax

INT(Operand)

Examples

INT("Channel 1") sends the integral with the current and last value of "Channel 1".

INT_UP

Sends the upper integral with the calculation formula "Op1 * DeltaT".

Syntax

INT_UP(Operand)

Examples

INT_UP("Channel 1") sends the upper integral with the current value of "Channel 1".

LIN

Runs a linearization with the defined nodes. Between 2 and 16 nodes can be defined. Please note to enter the input values monotonously rising.

Syntax

LIN(Operand; x-Node-1;y-Node-1;x-Node-2;y-Node-2)

Examples

LIN(0.5; 0;0;1;2;2;6) => 1

LIN(1.5; 0;0;1;2;2;6) => 4

MAJOR

Sends the greater value of Operand1 and Operand2.

Syntax

MAJOR(Operand1; Operand2)

Examples

MAJOR(6.23; 1.9) => 6.23

MAJOR(2.41; -4.1) => 2.41

MAX

Detects the operator's maximum. The calculation uses all valid values.

Syntax

MAX(Operand)

Examples

MAX("Channel 1") sends the greatest of all values of "Channel 1" over all valid values.

MEAN

Sends the operator's average. The averaging uses all valid values if the optional number of values is not defined or the number of values is 0. If a number of values unequal 0 is set, the average calculation runs about the defined number of.

Syntax

MEAN(Operand)

MEAN(Operand; Value of numbers)

Examples

MEAN("Channel 1") sends the average of "Channel 1" over all valid values.

MEAN("Channel 1"; 10) sends the average of "Channel 1" over the last 10 values.

MIN

Detects the operator's minimum. The calculation uses all valid values.

Syntax

MIN(Operand)

Examples

MIN("Channel 1") sends the smallest of all values of "Channel 1" over all valid values.

MINOR

Sends the smaller value of Operand1 and Operand2.

Syntax

MINOR(Operand1; Operand2)

Examples

MINOR(6.23; 1.9) => 1.9

MINOR(2.41; -4.1) => -4.1

NOTB

Corresponds to the bitwise Not operator. All bits, which are set in the operand, are not set in the result; all other bits are set in the result.

Syntax

NOTB(Operand1)

Examples

NOTB(27) => 4294967268

NOTB(12) => 4294967283

OR

Corresponds to the logical Or operator. If at least one partial condition is met, value 1 is sent, otherwise 0.

Syntax

Operand1 OR Operand2

Examples

(2.4 > 1.2) OR (21.3<34.1) => 1

(2.4 < 1.2) OR (21.3<34.1) => 1

(2.4 > 1.2) OR (21.3=34.1) => 1

(2.4 < 1.2) OR (21.3=34.1) => 0

ORB

Corresponds to the bitwise Or operator. All bits, which are set in at least one operand, are also set in the result; all other bits result in 0.

Syntax

Operand1 ORB Operand2

Examples

27 ORB 12 => 31

27 ORB 13 => 31

27 ORB 8 => 27

PREV

Sends the previous operator value. The result of the first calculation is NoValue if the optional initial value is not defined. If the initial value is sent, it is used as result of the first calculation.

Syntax

PREV(Operand)

PREV(Operand; Initial value)

Examples

PREV(“Channel 1“) sends the value of “Channel 1“ from the previous calculation cycle, the result of the first calculation is NoValue.

PREV(“Channel 1“; 10) sends the value of “Channel 1“ from the previous calculation cycle, the result of the first calculation is 10.

ROUND

Rounds a floating point off to the smaller integer if the floating point rest is less than 0.5. Rounds a floating point up to the greater integer if the floating point rest is greater than or equal to 0.5.

Syntax

ROUND(Operand)

Examples

ROUND(13.53) => 14.0

ROUND(2.41) => 2.0

SHL

Moves Operator1 by the number of bit positions defined by Operator2 to the left.

Syntax

Operand1 SHL Operand2

Examples

1 SHL 2 => 4

12 SHL 1 => 24

SHR

Moves Operator1 by the number of bit positions defined by Operator2 to the right.

Syntax

Operand1 SHR Operand2

Examples

1 SHR 2 => 0

12 SHR 1 => 6

TESTBIT

Analysis if a specific bit is set. If the bit defined by Operand2 is set, the result is 1, otherwise 0.

Syntax

TESTBIT(Operand1; Operand2)

Examples

TESTBIT(27; 1)=> 1

TESTBIT(27; 2)=> 0

TESTMASKS

Runs a comparison with a definable bit mask. If at least one bit is set in Operand1, as well as, in Operand2, the result is 1, otherwise 0.

Syntax

TESTMASKS(Operand1; Operand2)

Examples

TESTMASKS(27; 6) => 1

TESTMASKS(27; 4) => 0

TIME

A time counter, which adds times and sends the sum, as long as the operator's values are >= 0.5. If the operator is < 0.5, the time counter is reset and sends 0.0.

Syntax

TIME(Operand)

Examples

TIME(“Channel 1“ > 10) sends the period over which the values of “Channel 1“ are greater than 10. If the “Channel 1” values are less than or equal to 10, the time counter is reset to 0.

TIMER

A time emitter, which sends 1 if Op1 is not changed within Op2 seconds, otherwise 0.

Syntax

TIMER(Operand1;Operand2)

Examples

TIMER("Channel 1";10) sends 0 if the value of the operand is changed for the first time. If the value is not changed again within 10 s after an entry, 1 is sent.

VALID

Checks Operand1 for validity (NoValue).

If only one operand is used, 1 is sent in case of a valid value and 0 in case of an invalid value.
If a second operand is used, the value of operand 2 is sent in case of invalidity of operand 1 (even if it corresponds to the NoValue); otherwise the value of operand 1 is sent.

Syntax

VALID(Operand1)

VALID(Operand1, Operand2)

Examples

VALID(1.45) => 1.0

VALID(NaN) => 0.0

VALID(1.45; 2.31) => 1.45

VALID(NaN; 2.31) => 2.31

VALID(NaN; NaN) => NaN

XOR

Corresponds to the logical Exclusive-Or operator. If one of the partial conditions is met, value 1 is sent, otherwise 0.

Syntax

Operand1 XOR Operand2

Examples

(2.4 > 1.2) XOR (21.3<34.1) => 0

(2.4 < 1.2) XOR (21.3<34.1) => 1

(2.4 > 1.2) XOR (21.3=34.1) => 1

(2.4 < 1.2) XOR (21.3=34.1) => 0

XORB

Corresponds to the bitwise Exclusive-Or operator. All bits, which are set in both operands, are also set in the result; all other bits result in 0.

Syntax

Operand1 XORB Operand2

Examples

27 XORB 12 => 23

27 XORB 13 => 22

27 XORB 8 => 19

6.3.3 Limit value monitoring

The limit value monitoring allows you to control channels within IPEmotion. You can define thresholds for each channel, which initiate a user-defined action at e.g. exceeding the upper or lower limit value. These actions, e.g. showing text messages, can also be configured. You have also the ability to control the limit values by using the visual elements. At exceeding the upper or lower limit value, e.g. the color of the bar display changes according the pre-set definition.

IPEmotion with the versions IPEaddonIPEmotion LOG V03.21 and TESTdrive V03.21 offers the ability to set upper and lower limits as formula. The formula must have a boolean result. A limit value can be defined as follows:

- Constant
- Formula with boolean result

TESTdrive documents every limit value violation in the log file, as well as, in the measuring status file.

Documentation in log file

The limit value violation is documented, as well as, the return of the signal value into the set range.

Example for a signal, which temporary exceeds the upper limit value and then returns back to a value in the set range:

26.08.2010 02:38:09 I Signal DIN 01 is above upper limit

26.08.2010 02:38:11 I Signal DIN 01 is below upper limit

Documentation in the measuring status file

Every signal, which causes a limit value violation, is listed with the number of limit violations. The file format is XML.

```
<LimitViolationLists>
  <LimitViolationList signalName="DIN 01">
    <LimitViolations>
      <count>2</count>
    </LimitViolations>
  </LimitViolationList>
</LimitViolationLists>
```

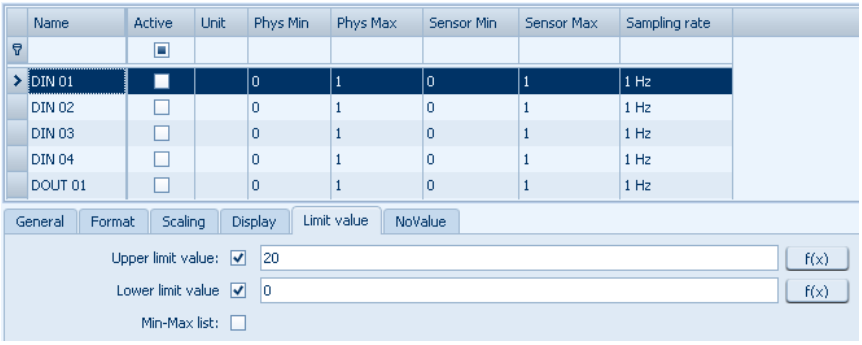
Limit value as constant

Every limit value violation is immediately reported and logged. The limit value violation is only reset if the signal returns into the set range by passing a hysteresis of 2%. A hysteresis is calculated as follows: Hysteresis = (upper limit – lower limit) * 0.02.

If one of the limits is not set, the corresponding value of the displaying range is used.

Always control the value of the displaying range at activating the limit value controlling and adapt them - if required. Otherwise, the hysteresis can reach a value too high.

The standard values of the displaying range for floating point signals are - 3,4E+38 and 3,4E+38.



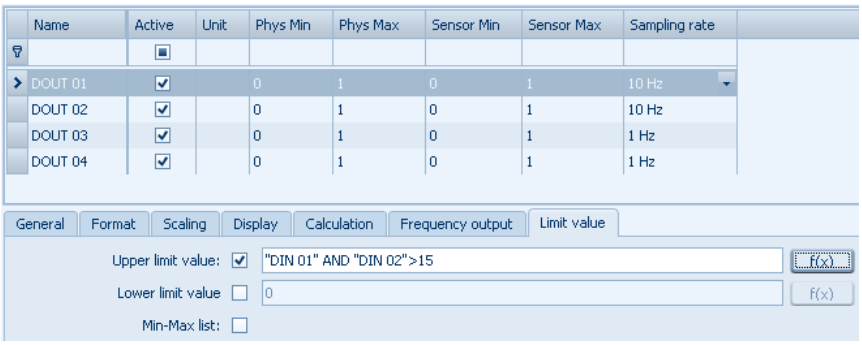
Limit value as formula

A formula can also be used instead of a fix value.

Example: "DIN 01" AND "Ramp" > 15

26.08.2010 01:22:50 I Signal DOUT 01 is above upper limit

26.08.2010 01:24:04 I Signal DOUT 01 is below upper limit



Defining limit values

The limit value configuration takes place within the **Acquisition** main navigation tab.

Select in the left overview the **Limit values** function and click on **Add limit value**.

To define the settings for the **limit value properties**, proceed as follows:

Select in the right window of the channel view the desired limit value. You can find the **Configuration** tab in the window of the configuration dialog. You have the following configuration possibilities:

Channel

Define the channel for the limit value by using the *Channel selection* dialog window.

Comparison operator

Comparison value

Define a fix value or set a comparison to another channel. Assign by using the *Limit value condition* dialog and the formula definition.

By using the **Settings** tab you can define the following definitions:

Color

Define a color for clarifying an exceeding of the upper or lower limit value (limit violation).

Trigger condition

Define the trigger condition as *Level* or *Edge*.

Hysteresis

Define the value by which the limit value has to be lower after exceeding the upper limit value before initiating a new limit value message.

- By using the **Output** tab you have the ability to select the following properties:

  - Output location

  Define the output in a *message window* or on an *output channel*.

  - Output channel

  If you have selected the output channel as output location, define the desired channel by using the *Channel selection* dialog window.

  - Output value

  If you have selected the output channel as output location, define the value to be set on the output channel.

  - Message type

  IPEmotion differs between three different message types. Define an individual message type for each limit value (Information, Warning, Error).

  - Message

  Edit any user-defined clear text description.

- The **Program** tab offers the folllowing configuration possibilities:

  - Execute

  Connect limit values with scripts or programs and run the limit control per key activation or click. You can load internal scripts from the scripting environment, as well as, external vbs files. The external scripts are then loaded into the scripting environment.

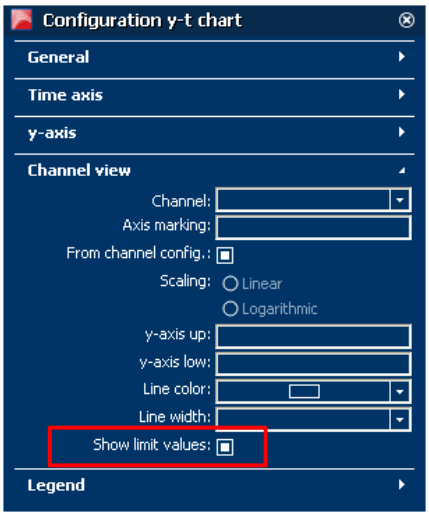
Displaying limit violations

IPEmotion offers the ability to display limit violations by using all instruments, diagrams, and colors. The colored displaying within the digital elements is not possible.

The displaying of violations takes place within the **View** and Analysis main navigation tabs.

- Select a visual element and open the diagram properties by double-clicking inside the displaying area.

- Activate the limit value displaying.



yt-chart

Limit violations are displayed by using continuous lines and a changing background color of the corresponding channel name within the legend.

Alphanumerical display

Limit violations are displayed by using a changing background color.

Progress bar

Limit violations are displayed by using a changing font color of the digital display and the bar. Additionally, marks are set within the bar by using simple lines. This method allows a permanent visibility of the limit value.

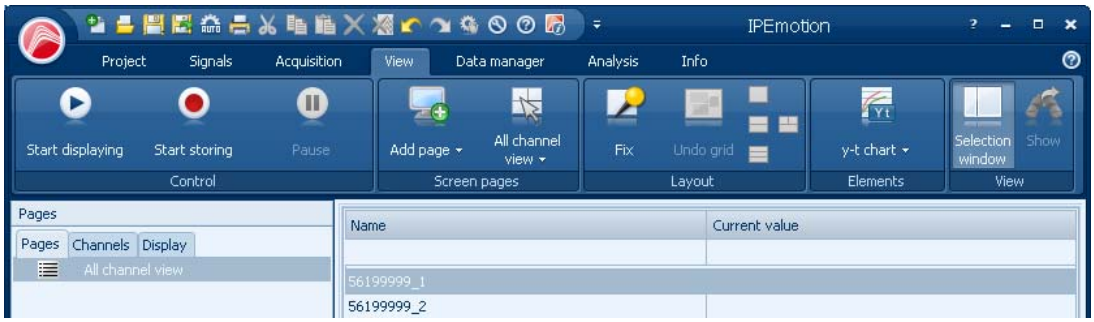
Tachometer

Limit violations are displayed by using a changing font color and a colored scale.

Analog display

Limit violations are displayed by using a changing font color and a colored scale.

6.4 View



The **View** main navigation tab offers you the ability to visualize channels with different visual elements (e.g. progress bar, analog display, etc. for momentary values, diagram for a chronological sequence).

6.4.1 Using the visual elements

A precondition for using the visual elements is the availability of channels in your configuration. To do so, select in the *Signals* main navigation tab the hardware to be used, the system and the connected components (consult chapter 6.2 for detailed information).

The following section shows you examples based on the channels of the simulation mode.

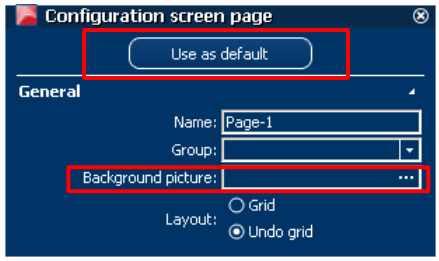
With **many defined channels**, it can become confusing to simplify the channels display. Multiple screen pages can be defined in IPEmotion, which can be toggled. The *Display of all channels* screen page is always available. It shows all momentary values of all channels from the start of acquisition.

Always all available channels of all active hardware systems are shown.

To display the desired channels and the respective data using a visual element, proceed as follows:

Click on the button **Add page** .

IPEmotion offers you the ability to configure a background picture for a **screen page**. To do so, select the desired page, open the **context menu** with the right mouse button and select the **Properties** entry. Subsequently define any background picture. Please note that a background picture is only available in the “Undo grid” layout!



The **Use as default** button allows you to save the current settings of the configuration dialog for the visual element. These settings are always loaded at opening the dialog. This function can also be used within the context menu of the respective element with the **Use as default** entry.

To allow an easy and quick overview of the single screen pages you can assign a hotkey for each page and navigate between the pages with little effort.

*Click on the corresponding page in the **Pages** tab and open the menu with the right mouse button. Or open the configuration dialog by double-clicking on the corresponding page.*

*Assign in the **Hotkey** field the desired keyboard shortcut and confirm with a click out of the entry field.*

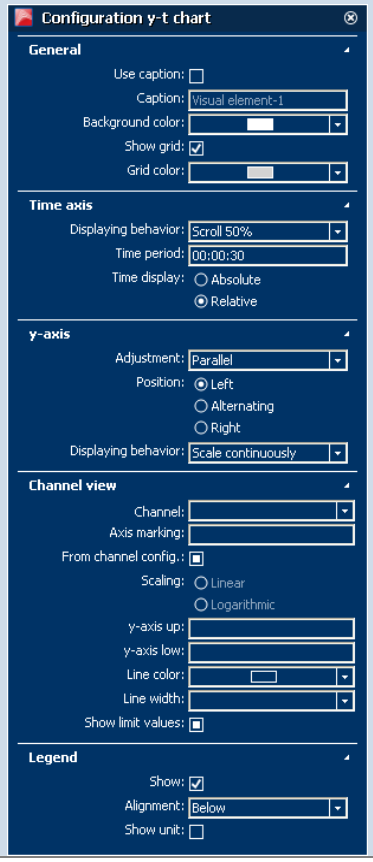
Possible hotkeys are functional keys, as well as, A-Z and 0-9 in any combination with <Shift>, <Alt> and <Ctrl>. Excluded are the keys and combinations, which are preallocated by the system, e.g. F1 (Help), F10, etc.

Select the desired visual element under the **Elements** point by clicking on the arrow.

You have the ability to set user-defined configurations according the respective visual element. Define for instance the following properties for the yt-chart:

- *General*
- *Time axis*
- *y-axis*
- *Channel displaying*
- *Legend*

These configuration abilities offer a structured and individual displaying of the data.



You can divide the screen area into several areas if you want to display different signals by using various visual elements. Select the desired **Layout** of the screen areas by clicking the corresponding layout symbol.

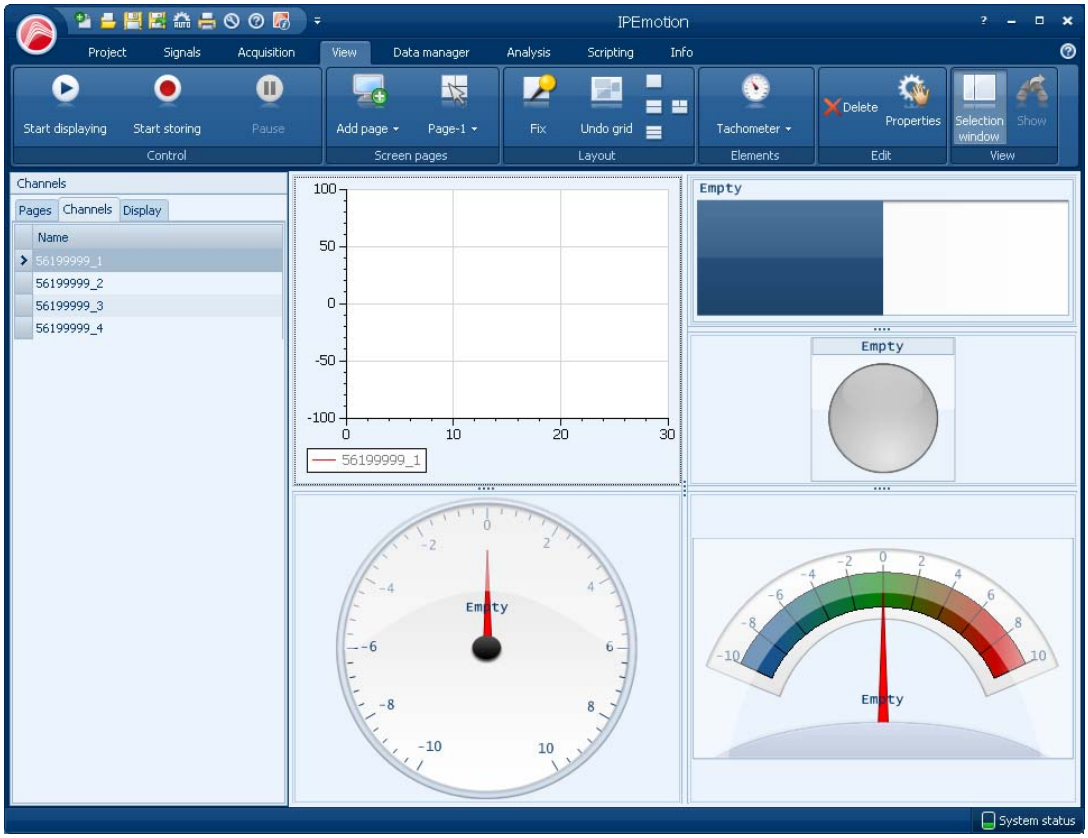
IPEmotion offers you the ability to divide every single displaying area into more areas. By doing so, you can use various visual elements for different channels. Click in the desired displaying area and open the menu with the right mouse button. Select the corresponding horizontal or vertical division.

Change into the **Channels** tab and select the desired channels. You also have the ability to use multiple selections. Drag the selected channels into the right screen area by using the Drag&Drop function.

After having displayed the necessary channels, click on **Start displaying** . You can now read your momentary values from the respective visual element – but these values are not recorded and stored.

IPEmotion is designed to allow settings of the screen configuration and the visual elements during a running acquisition. You can – if needed – add a signal or edit the scaling without stopping the acquisition or extending the testing period.

Please note that the online sampling rate is maximum 100 Hz!



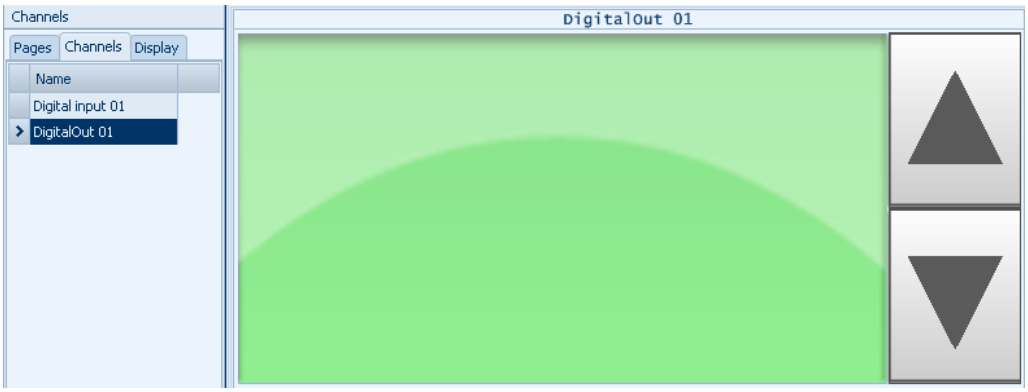
To stop the data displaying, click on **Stop displaying** .

To allow a maximum use of your available screen size and clearly display the visual elements, IPEmotion offers the following functionalities:

- *Click on the **Selection window** button to hide the left overview window.*
- *Click on the function overview of the main navigation tab and open the menu with the right mouse button. Activate the **Minimize the ribbon** function to hide the function overview.*

Alphanumerical display

IPEmotion V01.09 includes the alphanumerical display to set outputs.



Double-click on the element or the **Properties** entry in the context menu to open the configuration dialog. You can now define the following settings:

You can find the **Output** option within the channel view. Select from the following mode the desired mode to increase/decrease a value:

- Not settable
- Adjust freely
- Adjust step-by-step (Standard)

The alphanumerical display offers an **input field** for setting the values during an acquisition, which can be opened with a double-click on the visual element. Confirm your configuration with Enter or cancel with Esc. If you enter a value with a wrong format or which is out of the value range, the input will be ignored.

If you have selected the **Adjust step-by-step** option, 2 spin buttons are shown at the right side of the element for increasing/decreasing the current value.

A single click increases/decreases the current value by the smallest possible step width. The longer you keep the mouse button pressed, the more the step width increases.

The step width depends on the number of decimal places that have been defined for the channel (Signals main navigation tab -> Display tab -> Formatting -> Decimal places). If the number of decimal places is set dynamically (option: "Automatic"), the value of an integer channel is increased/decreased by one binary digit. The maximum number of decimal places is set for channels based on floating point values.

If the focus is set on the alphanumerical element, you can also increase/decrease the values with the keyboard handling (see Keyboard handling -> Alphanumerical display).

LED

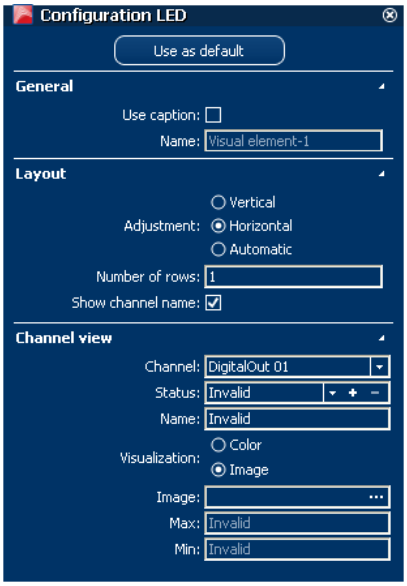
The LED visual element offers you the ability to define and visualize any number of status of analog, as well as, digital channels. This functionality allows you to control the value range of the corresponding channel at any time of measurement.

Every status is defined by a configurable value range. The upper limit is a status property, the lower limit results from the upper limit of the previous status. The lower limit of the first status is the channel minimum. The upper limit of the last status is the channel maximum.

- Double-click on the element or the **Properties** entry in the context menu to open the configuration dialog. You can now define, for instance, the following settings:

  - You can find the **Status** option within the channel view. Select the desired status from the following standard modes. Please note that these three status are always available and cannot be deleted:

    - Invalid (No value range can be shown if the channel sends a NoValue.)
    - Off (This predefined status has the value range channel minimum to 0.)
    - On (This predefined status has the value range greater than 0 to channel maximum.)
    - The **Plus** button allows you to add another status, which has to have a valid upper limit (Max). The **Minus** button can be used for deleting a selected status. The status are sorted in ascending order according to the Max limit.

  - The **Visualization** option defines if the status is connected with a color or an image. The following color codes are defined for the three standard status: Invalid = Grey, Off = Olive, On = Yellow. The following image formats are currently supported: .BMP, .JPG, .JPEG, .GIF, .PGN, .TIF, .TIFF, .EMF.

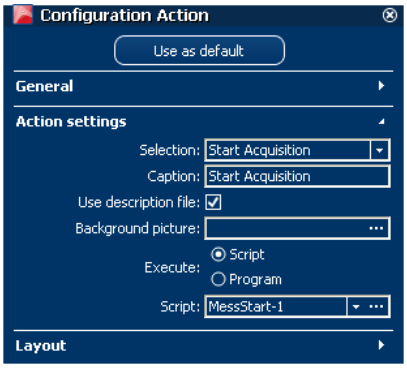
Action

The **Action** visual element offers you the ability to run scripts or programs per keystroke. You can load internal scripts from the scripting environment, as well as, external vbs files. The external scripts are loaded into the scripting environment.

- Open the context menu with the right mouse button and select **Add action** (any number of) or **Delete action**.

- Double-click on the element or use the **Properties** entry in the context menu to open dialog. You can now define the following settings:

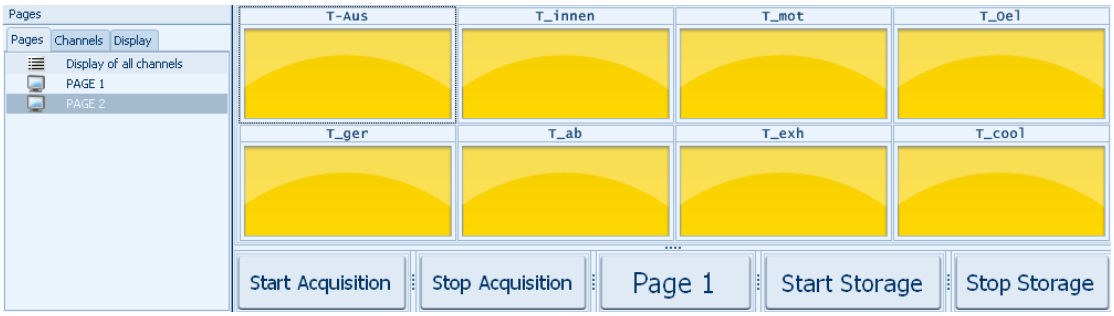
  - Caption of the element



- Background picture
- Execution as script or program and selection of the same

Open the *General* and *Layout* tabs to define further settings.

The following example shows a possible configuration of several action elements on 2 pages in combination with the alphanumerical display element (yellow).



6.4.2 Keyboard handling

IPEmotion allows a continuous keyboard navigation for the view tab. You can use the following keyboard navigation for display purposes:

General

- **Page Up/Page Down** - Change the selected page
- **Tab** – Focus the next element
- **Tab+Shift** – Focus the previous element
- **Ctrl+C** – Copy the element
- **Ctrl+V** – Paste the element
- **Ctrl+X** – Cut the element
- **Delete** – Delete the element

Content tree

- **Ctrl** →/← - Show/hide subnodes
- /↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all

- **Ctrl+move node with mouse** – Cut node and add to destination node
- **Shift+move node with mouse** – Cut node and add above destination node
- **Alt Gr+move node with mouse** – Cut node and add below destination node
- **Page Up/Page Down** – Select first/last node

List of channels

- /↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all
- **Page Up/Page Down** – Select first/last node

List of pages

- /↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all
- **Page Up/Page Down** – Select first/last node

Alphanumerical display

- **Enter** – Open the input field
- **Enter (input field open)** – Set value and close input field
- **Esc (input field open)** – Close input field and do not set value
- **+/- (spin buttons active)** - Increase/decrease the value
- /↓ **(spin buttons active)** - Increase/decrease the value

Slider

- **+/-** - Increase/decrease the value
- →/← - Increase/decrease the value of a horizontal slider
- ↑/↓ - Increase/decrease the value of a vertical slider

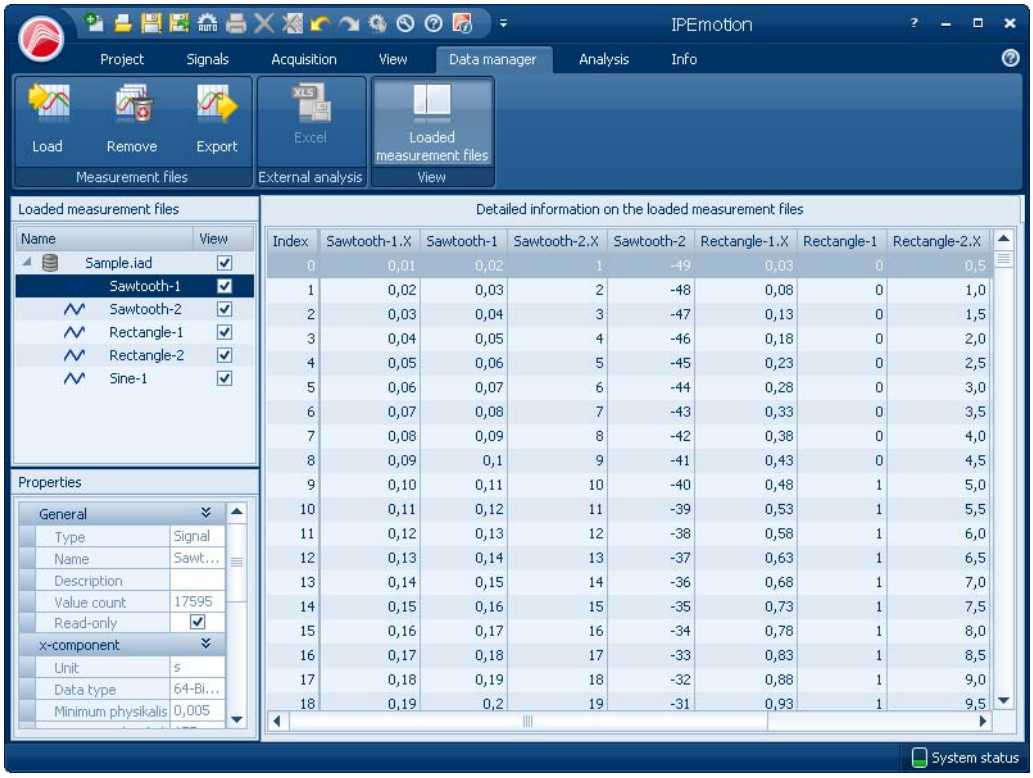
Switch

Space bar – Change between the status “On” and “Off” of the output

Action

Enter – Execute program/script

6.5 Data manager



The **Data manager** main navigation tab offers you the ability to manage and analyze the acquired data.

Open the desired dataset (*.iad file) the **Load** button.

Detailed information is shown for the measured channels of an open dataset in the area *Properties*. Loaded acquisition datasets can be converted to other supported file formats and/or stored via the dialog **Export**.

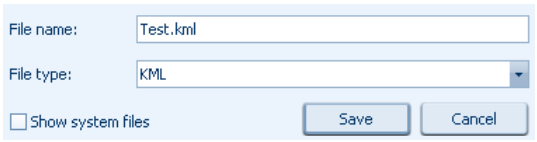
*To export records by using the **Export** or **Excel** button into the Excel format, at least Excel 2003 has to be installed on your computer.*

6.5.1 Data formats

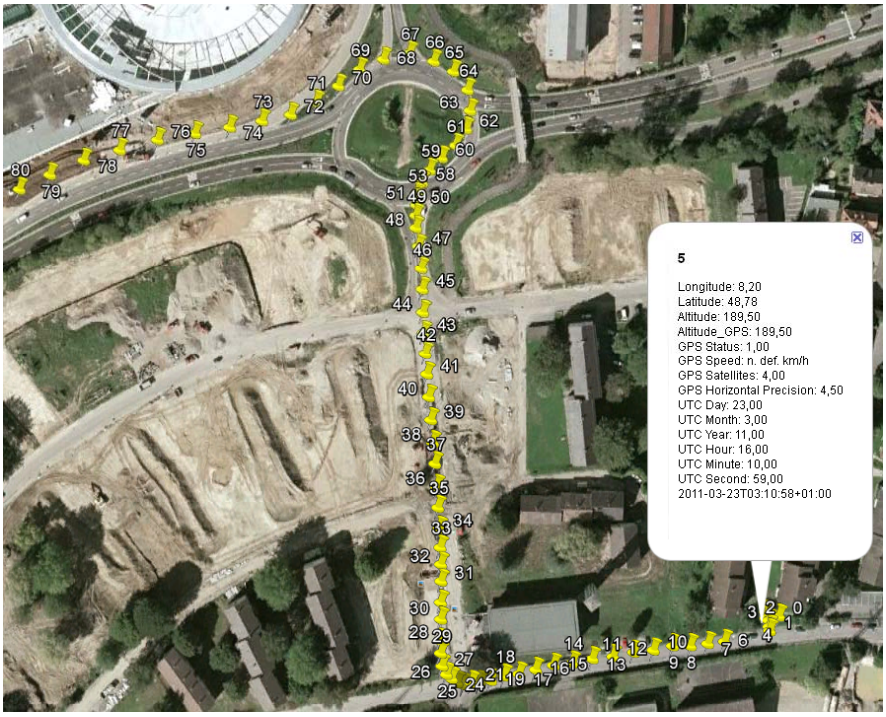
KML

KML (Keyhole Markup Language) is a markup language to describe geo data for Google Earth and is based on XML. The World Geodetic System 1984 is exclusively used as geodetic reference system in KML documents. This system includes all coordinates with geographical length, width, and height above sea level (if available). The KML format in IPEmotion offers you the ability to store measurement and route data and to visualize these data in Google Earth.

- Select the **Data manager** main navigation tab.
- Open the desired data set (DIAdem DAT file) with the **Load** button.
- Convert the loaded data set with the **Export** button into the KML format. Save the file in the standard export directory or in a user-defined one.



- Open the file with Google Earth. All coordinates with latitude, longitude, and altitude are shown, as well as, additional positioning parameters or information according to your configuration in IPEmotion.

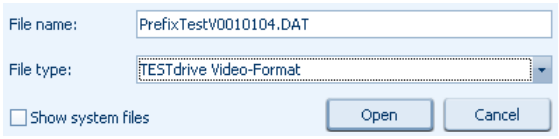


- The **Analysis** main navigation tab allows to show the data within a diagram and to visually analyze data.

TESTdrive video data

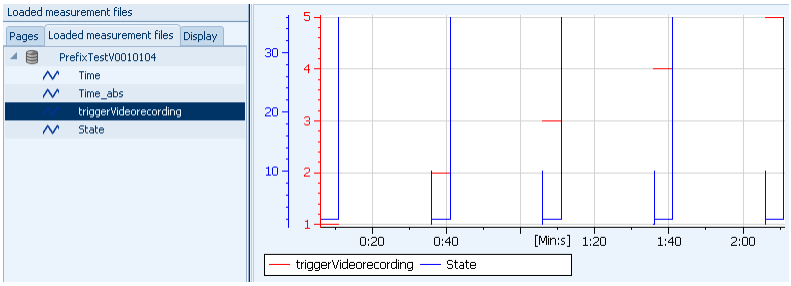
TESTdrive is used as measurement application by IPETRONIK for in-house data logger systems (M-LOG, S-LOG, FLEETlog). IPEmotion offers you the ability to store triggered video data on the data logger and to subsequently analyze data in IPEmotion.

- Select the **Data manager** or **Analysis** main navigation tab.
- Open the desired data set in TESTdrive Video-Format with the **Load** button.

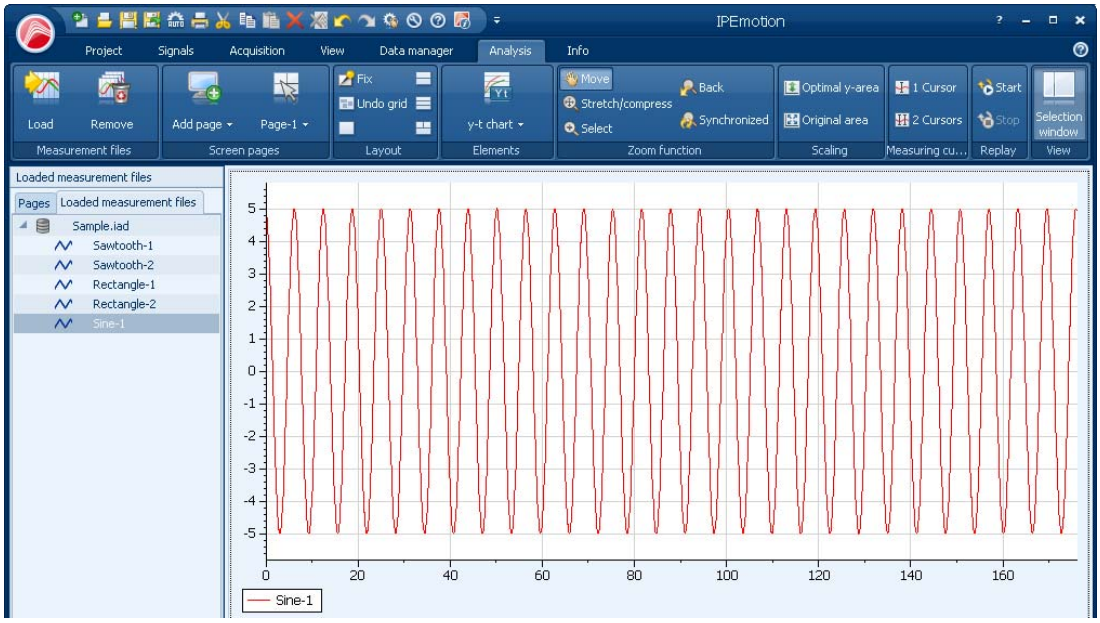


- The **Analysis** main navigation tab allows to play and visually analyze the video sequences within the **Video display** element. Different video files / sections are visualized with a red line or you can Use the slide control under the visual element to display different sections.

The **y-t chart** element in combination with the video display offers you the ability to compare single video files / sequences with time-synchronous channels of the measurement file. Drop the corresponding trigger channel into the y-t chart. The single sequences in the example are visualized with a red line.



6.6 Analysis



The **Analysis** main navigation tab offers you the ability to visualize and analyze your data by using a y-t chart.

Drag the desired channels from the window *Loaded measurement files* into the chart by using the Drag&Drop function.

IPEmotion offers you the ability to visualize the single data in details by using the following zoom functions:

- Move – Move a single axis or both.
- Stretch/compress – Zoom in or out the displayed area of a diagram.
- Mark – Mark a specific area within the chart to enlarge this section of the diagram.

You can undo all zoom function and reset the displaying area to the original condition by using the button Original area.

6.6.1 x-y/y-t chart

IPEmotion offers you the ability to add the current ranges of the y-axes (x-y and y-t chart) to the configuration. To do so, open the context menu of the chart with the right mouse button and select the **Save axis offset** entry. If you do not select this function, the chart axes are set to default values after loading the configuration.

6.6.2 Keyboard handling

IPEmotion allows a continuous keyboard navigation for the analysis tab. You can use the following keyboard navigation for analysis purposes:

General

- **Page Up/Page Down** - Change the selected page
- **Tab** – Focus the next element
- **Tab+Shift** – Focus the previous element
- **Ctrl+C** – Copy the element
- **Ctrl+V** – Paste the element
- **Ctrl+X** – Cut the element
- **Delete** – Delete the element

Content tree

- **Ctrl** →/← - Show/hide subnodes
- ↑/↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all
- **Ctrl+move node with mouse** – Cut node and add to destination node
- **Shift+move node with mouse** – Cut node and add above destination node
- **Alt Gr+move node with mouse** – Cut node and add below destination node
- **Page Up/Page Down** – Select first/last node

List of loaded measurement files

- ↑/↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all
- **Page Up/Page Down** – Select first/last node

List of pages

- ↑/↓ - Select previous/next node
- **Shift** ↑/↓ - Add previous/next node to selection
- **Ctrl+A** – Select all
- **Page Up**/**Page Down** – Select first/last node

Extended measurement window

- ↑/↓ - Select previous/next node

yt-chart

- **Space bar** – Change the active measuring cursor
- →/← - Move the measuring cursor on the active graph by exactly one value
- /↓ - Move the active measuring cursor by 0.5 % of the x-axis range to the right/left
- **Home/End** - Move the active measuring cursor to the point, which is the closest to the upper/lower limit of the x-axis range
- **+/-** - Zoom in/zoom out the x-axis
- **Shift** - Mode "Select"
- **Shift +/-** - Zoom in/zoom out all y-axes
- **Ctrl +/-** - Zoom in/zoom out the active y-axis
- **Shift** →/← - Move the x-axis by one axis scaling to the right/left
- **Ctrl** →/← - Move the x-axis by the total length to the right/left
- **Shift** ↑/↓ - Move all y-axes by one axis scaling up/down
- **Ctrl** ↑/↓ - Move the active y-axis by one axis scaling up/down
- **Ctrl/Alt** - Mode "Stretch/Compress"

xy-chart

- **Space bar** – Change the active measuring cursor
- →/← - Move the measuring cursor on the active graph by exactly one value
- /↓ - Move the active measuring cursor by 0.5 % of the time channel range back/forth

- **Home/End** - Move the active measuring cursor to the first/last point
- **+/-** - Zoom in/zoom out the x-axis
- **Alt +/-** - Zoom in/zoom out the active x-axis
- **Shift** - Mode "Select"
- **Shift +/-** - Zoom in/zoom out all y-axes
- **Ctrl +/-** - Zoom in/zoom out the active y-axis
- **Shift** →/← - Move the x-axis by one axis scaling to the right/left
- **Ctrl** →/← - Move the x-axis by one axis scaling to the right/left
- **Shift** ↑/↓ - Move all y-axes by one axis scaling up/down
- **Ctrl** ↑/↓ - Move the active y-axis by one axis scaling up/down
- **Ctrl/Alt** - Mode "Stretch/Compress"

Video display

- →/← - Move the slider to the next/previous position
- **Home/Ende** – Move the slider to the start/end position

Log p-h diagram

- →/← - Move the slider to the next/previous position
- **Home/Ende** – Move the slider to the start/end position

6.7 Scripting

Automate your acquisition sequences with the scripting function of IPEmotion. IPEmotion offers three basic types of automation: macro recording, in-process interface, out-of-process interface.

- With the **macro recording** you can record your actions in the graphical interface and run it later on as a script.

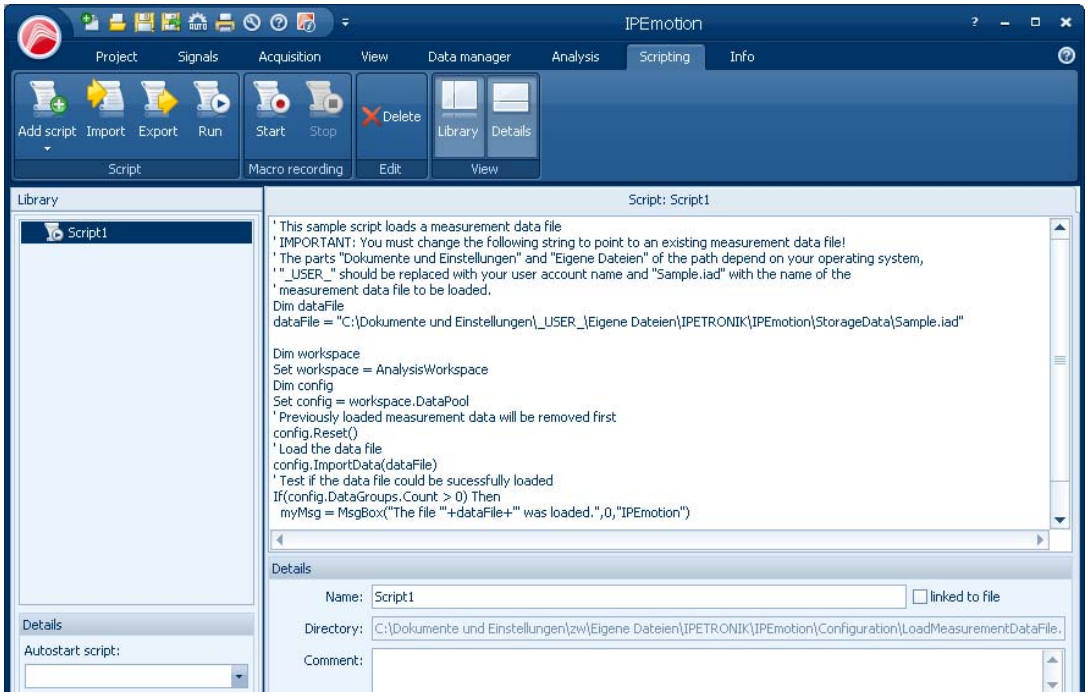
With the help of the **in-process interface** you can create and start Visual Basic Scripts (VBS) and IronPython Scripts (PY) within IPEmotion. You can find further information and a description of the COM interface in the IPEmotionCOM.chm.

With the help of the **out-of-process interface** you can address and control IPEmotion with an external program (see chapter 9). You can find further information and a description of the COM interface in the IPEmotionCOM.chm.

6.7.1 Internal automation interface

With the internal model of the IPEmotion automation interface (in-process) you have the ability to automate sequences within IPEmotion.

The internal interface addresses to users with basic skills in programming with Visual Basic Scripts. With the help of the in-process interface you can create and start own **Visual Basic Scripts** (VBS) and **IronPython** Scripts (PY) within IPEmotion. The integrated **macro recording** (VBS only!) allows you to record your actions in the user interface and run it later on as a script. You can therefore automate your sequences without extensive programming skills. The following figure shows an example script for loading data files:



Please note the following restrictions of the internal automation interface:

Messages can be shown in windows (VBS only!), the ability to create own dialogs for configuration options is available for PY.

The debug function of the VBS and PY scripts is within IPEmotion currently not available.

Using scripts

The following example shows how to use scripts.

- Click on the **Add script** button.
- You can load an existing script in the *.vbs/.py data format by using the **Import** button or select a defined script for the **Autostart**.

> *Only scripts of the *.vbs and *.py format can be imported.*

The current IPEmotion version offers the following standard scripts:

- ChangePage – Select the first page of the view area. Increase the item number to select other existing pages.
- Classification
- Database – Write the values of the first two formulas in IPEmotion into a Microsoft Access database.
- LoadMeasurementDataFile
- LoggerDataImport
- LoggerStorageGroup – Add all active channels to the first storage group of the IPETRONIK Logger in your system.
- MeasurementDataStatistic
- Raffertest
- StartDisplay – Start displaying the measurement values, e.g. with the action element.
- StartStorage – Start storing the measurement values.
- StopDisplayOrStorage – Stop displaying or storing the measurement values.
- InputQuery – Write the requested string into the first text variable in IPEmotion (the text variable must be available and IPEmotion should run in acquisition mode).
- PidControl – List all PID controllers in a popup window and configure the control parameters.
- StoragePrefix – Ask for the prefix of the first storage group before storing.

7 Practical application examples

The following chapter shows some examples how to use IPEmotion in praxis. This chapter is structured in the way that the respective examples are arranged according to the main navigation tabs. You get a reasoned and logical overview.

The following acquisition examples were operated under the following conditions: In addition, the example *Running a temperature acquisition* was operated by using the guided and step by step configuration.

- Used module configuration: - 5 M-THERMO 16
  - 1 M-SENS 8
  - 1 M-FRQ
- Baud rate of the devices: 500 kBit/s,
- Baud rate of the CAN hardware: 500 kBit/s.

> *The baud rate of the devices and the CAN hardware must be identical!*

First of all, you can check the device status. To do so, look at the LEDs:

- The LED is permanently on means that the corresponding device was detected.
- The LED is flashing means that one or more channels of the corresponding device are active.

7.1 Launching IPEmotion

First of all, make sure that all devices and the CAN hardware are connected and ready for use!

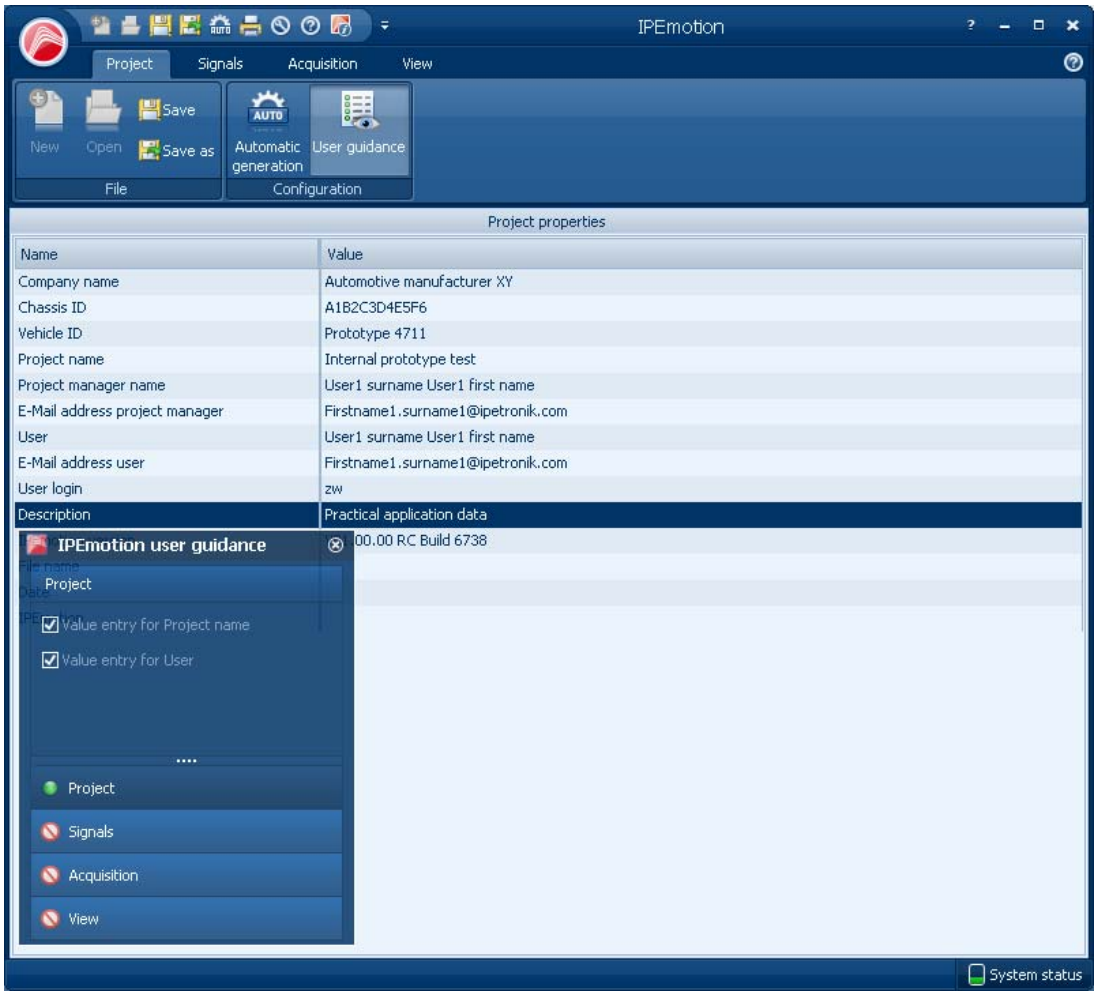
Start IPEmotion from the menu **Start** → **Programs** → **IPETRONIK** → **IPEmotion** and enter (if not done before) a valid license key in the **IPEmotion – Licensing** dialog. Confirm with **Assign** and close the dialog window with **OK** → **Close**.

The **Automatic hardware detection** dialog window appears at opening IPEmotion for the first time. Select the command **Guided and configuration step by step**.

7.2 Running a temperature acquisition

7.2.1 Project settings

First of all, define your configuration by using the project properties and check the respective done steps of the IPEmotion User guide.



It is recommended to save your configuration to avoid potential data loss. Click on **Save under** . Select the desired directory and enter any name. Confirm with **Save**. The selected file name is now displayed in the title bar of the IPEmotion user interface.

Select the next step **Signals** to continue.

7.2.2 Configuring modules and channels

All connected and detected devices with the respective available channels are shown in the main navigation tab **Signals**. By using the *Add system* or *Add component* button, you have the ability to amend the configuration with additional systems or modules.

Proceed as follows:

1. Select in the left tree view for instance the first module M-THERMO 16. You can find the **General** tab in the window of the configuration dialogs. Define the desired **sampling rate**. In our example it is 5 Hz.

2. **Activate** the desired **channels** in the right window of the channel view and select the desired **unit**. In our example the first 15 channels are selected and the unit is °C.

3. You can find the **General** tab in the window of the configuration dialogs. Define any name for each channel in the **Name** field. In the **Description** field you have the ability to edit additional information to the respective channel. In our example the following descriptions are selected:

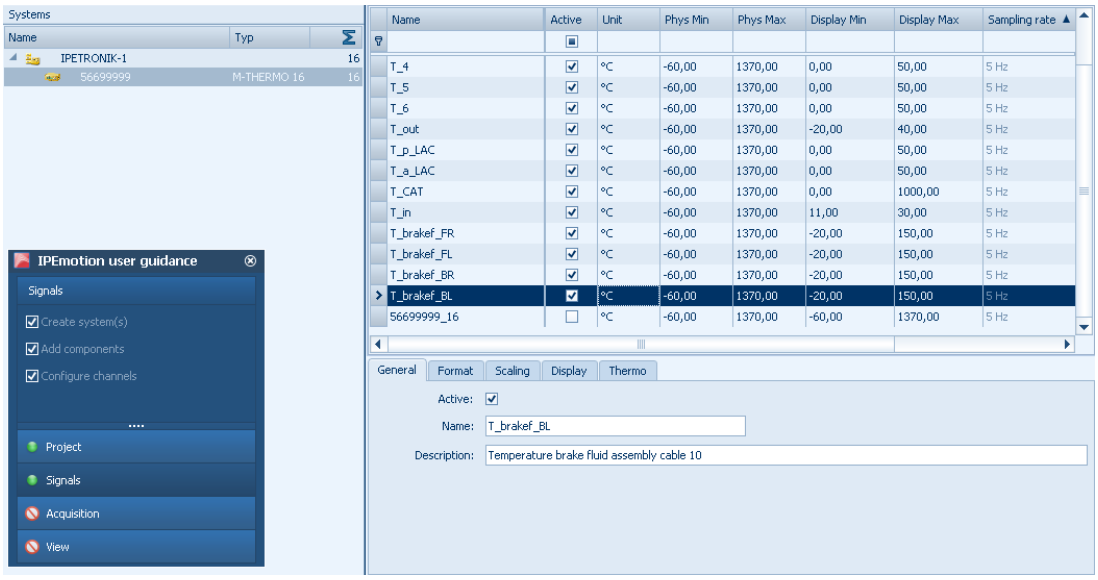
   - T_1 – T_6 (Temperature of channel 1 – 6)
   - T_out (outside temperature)
   - T_p_LAC (temperature before load air cooler)
   - T_a_LAC (temperature after load air cooler)
   - T_CAT (catalyst temperature)
   - T_in (inside temperature)
   - T_brakef_FR (brake fluid temperature front-right)
   - T_brakef_FL (brake fluid temperature front-left)
   - T_brakef_BR (brake fluid temperature back-right)
   - T_brakef_BL (brake fluid temperature back-left with additional description: Temperature brake fluid assembly cable 10)

4. Define the **maximum** and **minimum displaying range** of the acquisition value. To do so, you have the following two abilities:

   - Enter the values in the **channel view** within the **Display Min** and **Display Max** column.
   - Enter the values in the **Display** tab within the **Min** and **Max** field.

   In our example the following displaying ranges are selected:

- T_1 – T_6: 0 – 50 °C
- T_out: -20 – 40 °C
- T_p_LAC: 0 – 50 °C
- T_a_LAC: 0 – 50 °C
- T_CAT: 0 – 1000 °C
- T_in: 11 – 30 °C
- T_brakef_FR: -20 – 150 °C
- T_brakef_FL: -20 – 150 °C
- T_brakef_BR: -20 – 150 °C
- T_brakef_BL: -20 – 150 °C



Click on **Save** to store the made changes and configurations in the current file.

Check the respective made step of the IPEmotion User guide and select the next step **Acquisition** to continue.

7.2.3 Defining storage group(s) and formula(s)

In the **Acquisition** main navigation tab all available channels are shown. To add a formula to your configuration and to select the channels needed for the acquisition, proceed as follows:

1. Click on **Add calculation**.

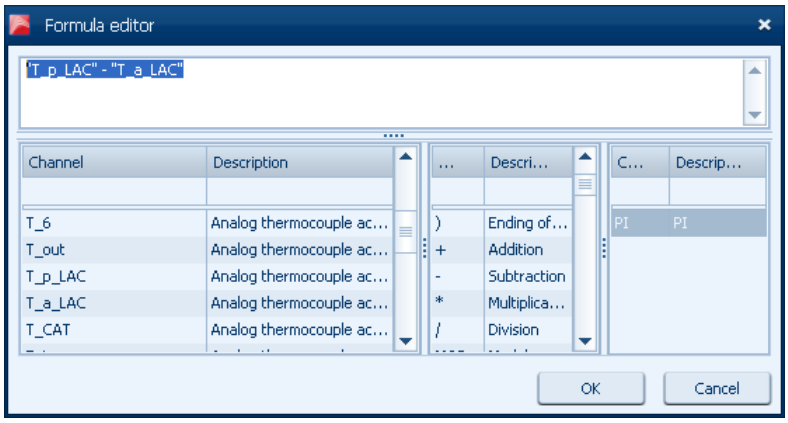
2. You can find the **General** tab in the configuration dialog window. Define any name for the formula in the **Name** field. In the **Description** field you have the ability to edit additional information. Repeat the steps 1 and 2 to add another formula to the calculations. In our example the following two formulas are defined:

   - T_Diff_LAC (temperature for preload air cooler)
   - T_brakef_B_medium (temperature average for brake fluid in the back)

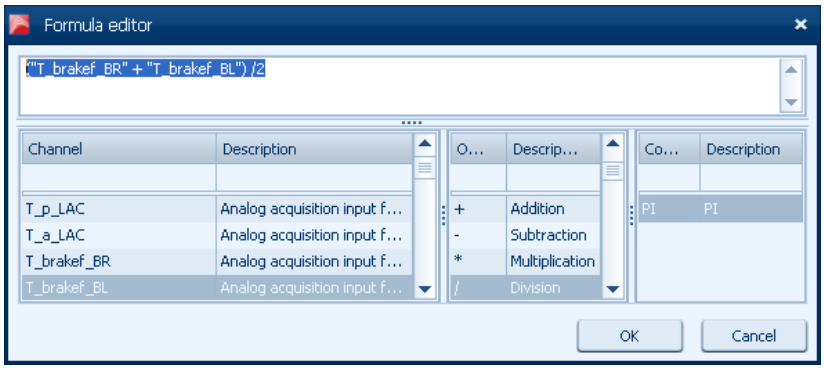
3. With the **Formula** tab you can define a formula for the calculation by using the $f(x)$ button. For selecting the contained channels and operators you have the following two possibilities:

   - Double-click on the corresponding channels and operator.
   - Drag the corresponding channel and operator into the upper window of the formula editor by using the Drag&Drop function.

4. Select in the *Formula editor* dialog window the first channel, than the operator, and finally the second channel. For calculating the temperature difference of the channels T_p_LAC and T_a_LAC, use the following formula:

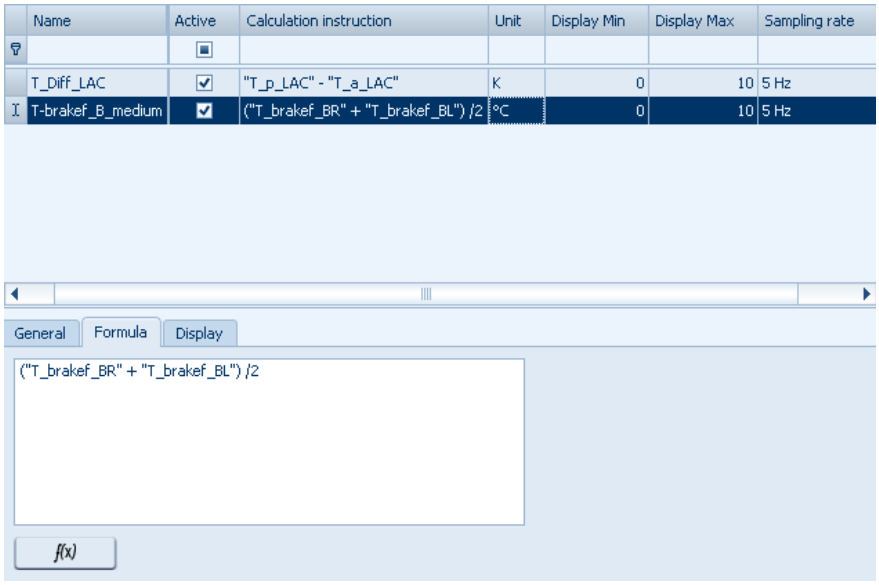


For calculating the temperature average of the channels T_brakef_BR and T_brakef_BL, use the following formula:



Confirm your selection with **OK**.

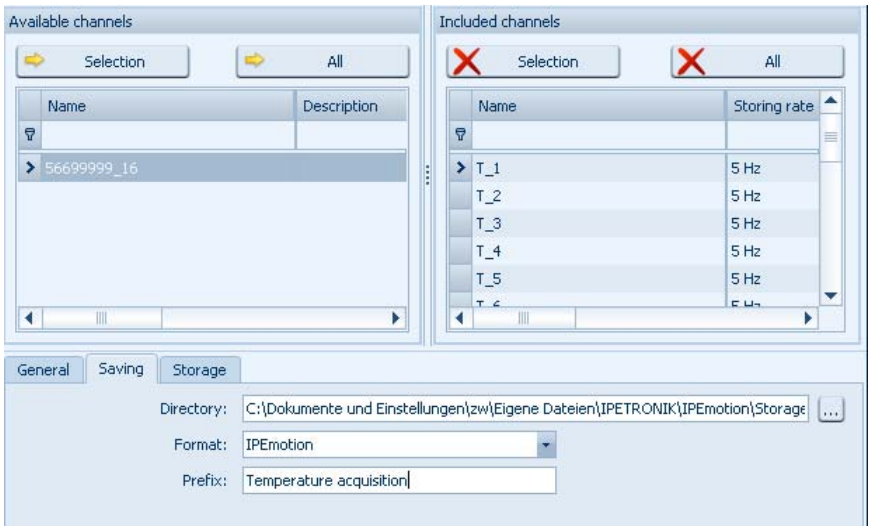
The calculation instructions are now shown in the IPEmotion user interface.



5. Select in the right view window the **Unit** and the **Sampling rate**. In our example the unit is K for the temperature difference and °C for the temperature average and the sampling rate is set to 5 Hz.

6. In the second part, you select the **Storage group-1** branch in the left tree view. All available channels are shown in the *Available channels* window. Select the desired channels and click **Selection** or drag the channels into the right overview *Included channels* by using the Drag&Drop function.

7. Using the **Saving** tab you can define the format and edit a prefix, e.g. Temperature acquisition.



Click on **Save** to store the made changes and configurations in the current file.

Check the respective made steps of the IPEmotion User guide and select the next step **View** to continue.

7.2.4 Visually displaying acquisition values

The **View** main navigation tab offers you the ability to graphically display the defined channels. In our example the following visual elements are defined:

- T_1 – T_6, T_p_LAC and T_a_LAC, T_brakef_BL – FR: yt-chart
- All used channels: Alphanumerical display

To display the desired channels and the respective data using a visual element, proceed as follows:

1. Select within the **Elements**

point the desired visual element.

2. Click on the button **Add page** . You can divide the screen area into several areas if you want to display different signals by using various visual elements. Select the desired **Layout** , , of the screen areas by clicking the corresponding layout symbol.

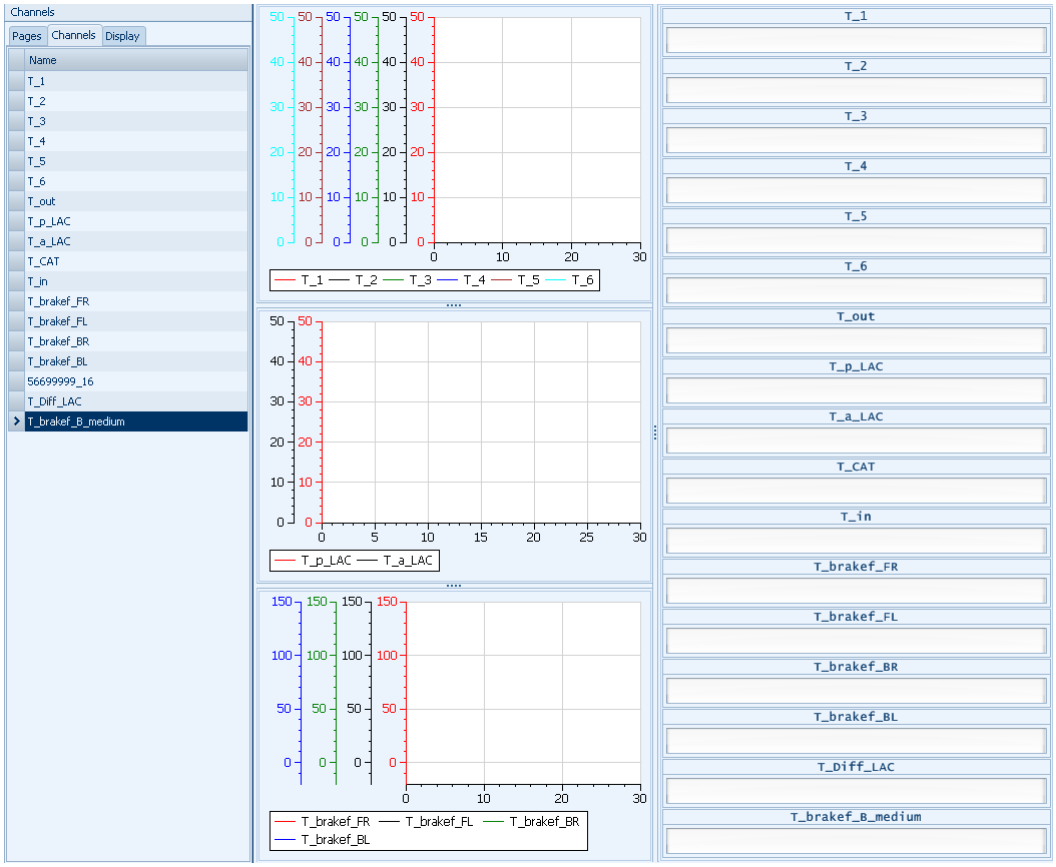
   IPEmotion offers you the ability to divide every single displaying area into more areas. By doing so, you can use various visual elements for different channels. Click in the desired displaying area and open the menu with the right mouse button. Select the corresponding horizontal or vertical division.

3. Change into the **Channels** tab and select the desired channels. You also have the ability to use multiple selections. Drag the selected channels into the corresponding screen areas by using the Drag&Drop function.

The properties of the respective visual element can be defined by using the **Properties** button or by **double clicking** on the element.

In our example the following properties are defined:

- The displaying behavior of the y-axis is fixed.
- The layout for the alphanumerical displays is vertical.



4. After having displayed the necessary elements and corresponding channels, click on **Start displaying** . You can now read your momentary values from the respective visual element – but these values are not recorded and stored.

5. To record and save the data, click on **Start storing** . The acquired data is now stored in the application data. At using the standard installation the data can be found in: Windows XP: C:\Documents and Settings\xx\My Documents\IPETRONIK\IPEmotion; Windows 7: C:\Program Files\Common Files\IPETRONIK\IPEmotion\StorageData\. To stop the recording click on **Stop storing** .

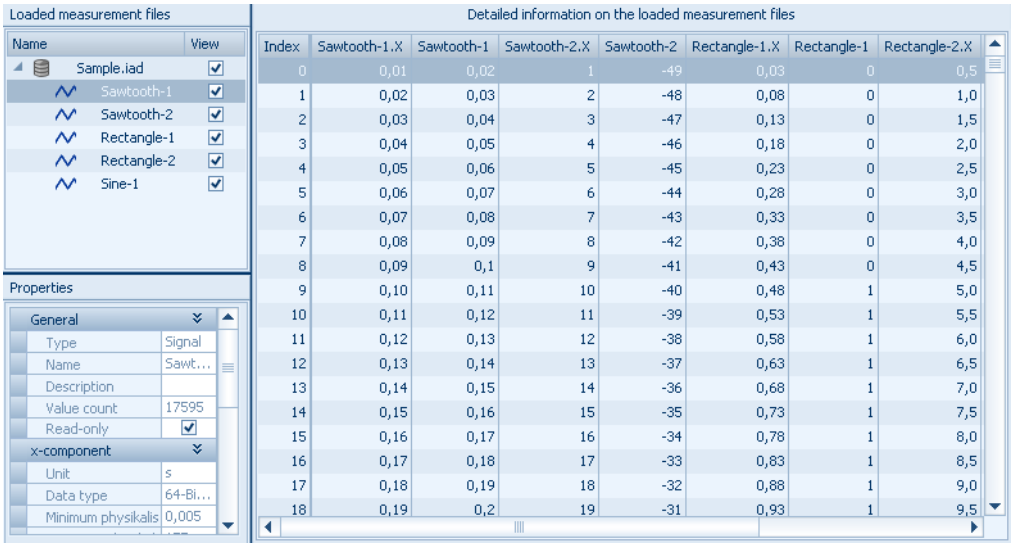
Click on **Save** to store the made changes and configurations in the current file.

Check the respective made steps of the IPEmotion User guide and close it with **OK**.

7.2.5 Managing the data

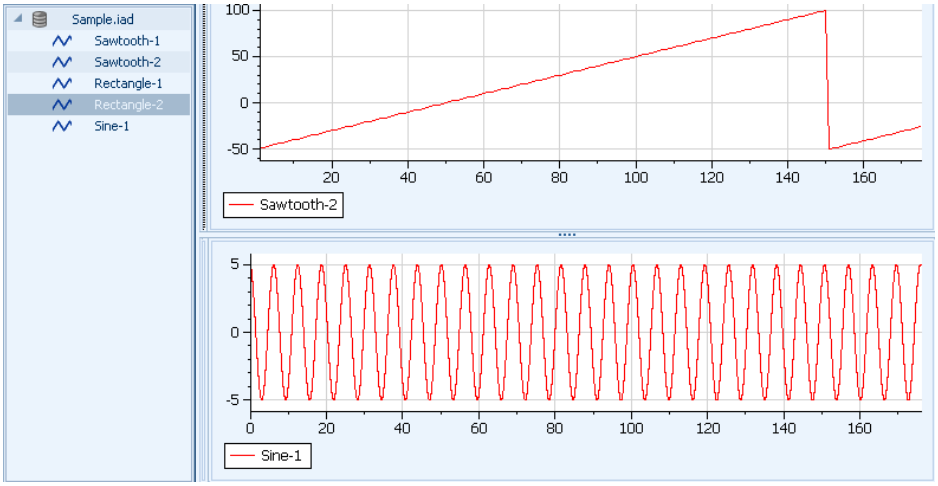
The **Data manager** main navigation tab offers you the ability to manage and analyze the acquired data and properties.

Open the desired dataset (*.iad file) with the **Load** button.



7.2.6 Displaying and analyzing data

The **Analysis** main navigation tab offers you the ability to visualize and analyze your data by using a y-t chart.



IPEmotion offers you the ability to visualize the single data in details by using the following zoom functions:

- Move – Move a single axis or both.
- Stretch/compress – Zoom in or out the displayed area of a diagram.
- Mark – Mark a specific area within the chart to enlarge this section of the diagram.

You can undo all zoom functions and reset the displaying area to the original condition by using the button Original area.

Furthermore, you can use the following keyboard navigation for analyses:

▼/▲ - Change between the screen pages

Charts (Measuring cursor): →/← - Move the measuring cursor on the active graph by exactly one value; ▼/▲ - Move the active measuring cursor by 0.5 % of the x-axis range to the right/left; **Home/End** - Move the active measuring cursor to the point, which is the closest to the upper/lower limit of the x-axis range; **Tab** - Change the active measuring cursor

Charts (Zoom mode mouse): **+/-** - Zoom in/Zoom out the x-axis; **Shift** - Mode "Select"; **Shift +/-** - Zoom in/ Zoom out all y-axes; **Ctrl +/-** - Zoom in/Zoom out the active y-axis; **Shift** →/← - Move the x-axis by one axis scaling to the right/left; **Ctrl** →/← - Move the x-axis by the total length to the right/left; **Shift** ↑/↓ - Move all y-axes by one axis scaling up/down; **Ctrl** ↑/↓ - Move the active y-axis by one axis scaling up/down; **Ctrl/Alt** - Mode "Stretch/Compress"

Video display (Progress slide control): →/←/↑/↓ - Change between the images within the video; ▼/▲ - Move back/forth within the video; **Home/End** - Change between the first/last image

7.3 Defining a pressure channel by using the scaling calculator

The following example shows how to use the scaling calculator for configuring a channel of a M-SENS device for a pressure acquisition.

The pressure module is a PMP 1400 of the company Druck with the following characteristics:

- 16 bar
- 0-5 V Output
- 9-30 V DC excitation

The complete configuration of a pressure channel by using the scaling calculator is defined within the **Signals** main navigation tab.

1. Select in the left tree view the M-SENS 8 module. You can find the **General** tab in the configuration dialog window. Define the desired **sampling rate**. In our example it is 100 Hz.

2. **Activate** the desired **channels** in the right window of the channel overview and select the desired **unit**. In our example the first two channels are selected and the unit is bar.

3. You can find the **General** tab in the configuration dialog window. Enter any name for each channel in the **Name** field. In the **Description** field you have the ability to edit additional information. In our example the following descriptions are defined:

   - p_CA (charge air pressure with additional description: Charge air pressure Company Druck pm 1400 Sn S02024/02)

   - p_AC (air conditioning pressure with additional description: AC not tight Danfoss MSB 3000 10206174)

4. By using the **Scaling** tab you can define the **physical range**, **sensor range** and **sensor mode**.

   Enter the values in the **channel view** within the **Phys Min** and **Phys Max** column or enter the values in the **Scaling** tab within the **Physical range Min** and **Max** field.

   Enter the values for the **sensor range**.

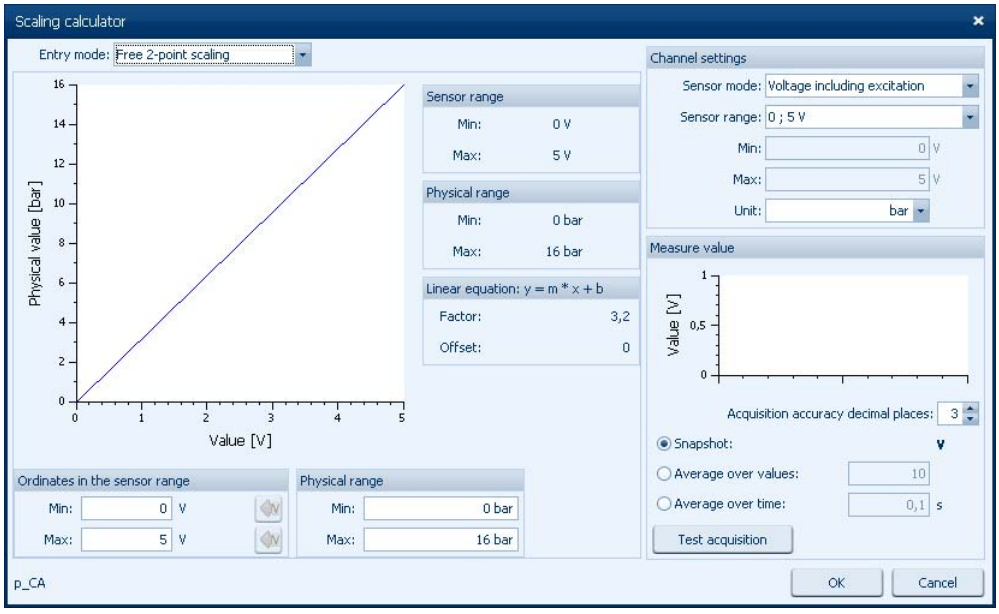
   Select **Voltage including excitation** as **Sensor mode**.

   In our example the following values for the channel p_CA are defined:

   Physical range: 0 - 16 bar

   Sensor range: 0 – 5 V (The sensor range was adjusted to get a higher resolution.)

   By using the **scaling calculator** and the 2-point scaling or the Free 2-point scaling you can alternatively define the values. Enter the desired values in the field **Ordinates in the sensor range** or select the values in the **Channel settings → Sensor range** area. Confirm your entries with **OK**.



5. In the **Display** tab a minimum of 0 and a maximum of 16 was selected for the displaying range. Or directly enter the values in the channel overview using the columns **Display Min** and **Display Max**.

6. In the **Sensor** tab a sensor excitation of 15 V was selected.

Click on **Save** to store the made changes and configurations in the current file. Or click on **Save as** to store the configuration using a different name.

7.4 Defining a RPM acquisition

The following example shows how to use the scaling calculator for configuring a channel of a M-FRQ device for acquiring a fan RPM.

The fan is a Balluff BOS M18.

7.4.1 Configuring the module and channel

The complete configuration of a frequency channel by using the scaling calculator is defined within the **Signals** main navigation tab.

1. Select the module M-FRQ in the left tree view. You can find the **General** tab in the configuration dialog window. Define the desired **sampling rate**. In our example it is 1 Hz.

2. **Activate** the desired **channel** in the right window of the channel overview and select the desired **unit**. In our example the first channel is activated and the unit is 1/min.

3. You can find the **General** tab in the configuration dialog window. Enter any name for the channel in the **Name** field. In the **Description** field you have the ability to edit additional information for the channel. In our example the following description is defined:

   n_fan (fan RPM with additional description: Balluff BOS M18 12345)

4. By using the **Scaling** tab you can define the **physical range**, **sensor range** and **sensor mode**.

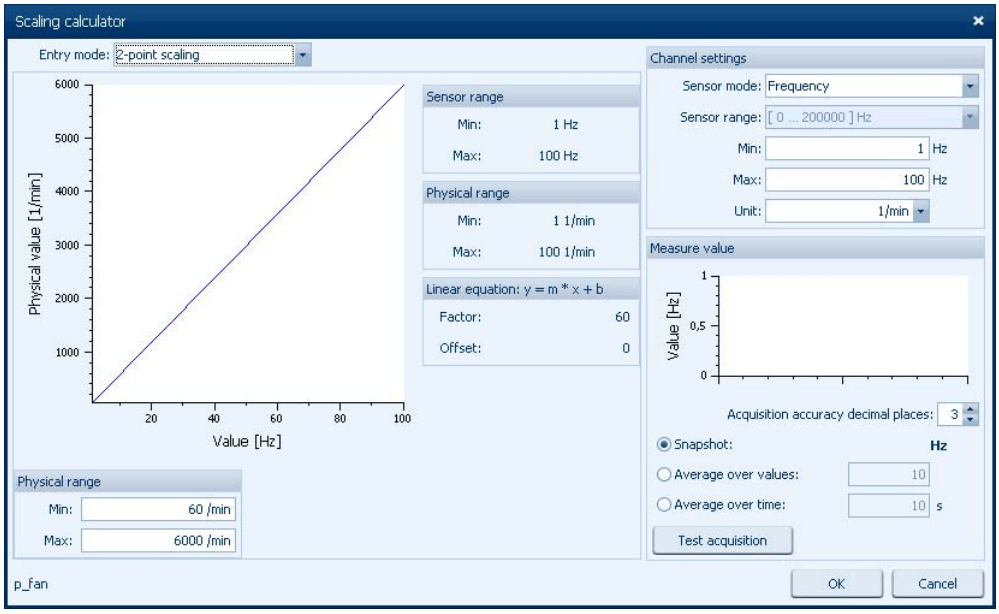
   Enter the values in the **channel view** within the **Phys Min** and **Phys Max** column or enter the values in the **Scaling** tab within the **Physical range Min** and **Max** field.

- Enter the values for the **sensor range**.
- Select **Frequency** as **Sensor mode**.

In our example the following values for the channel p_fan are defined:

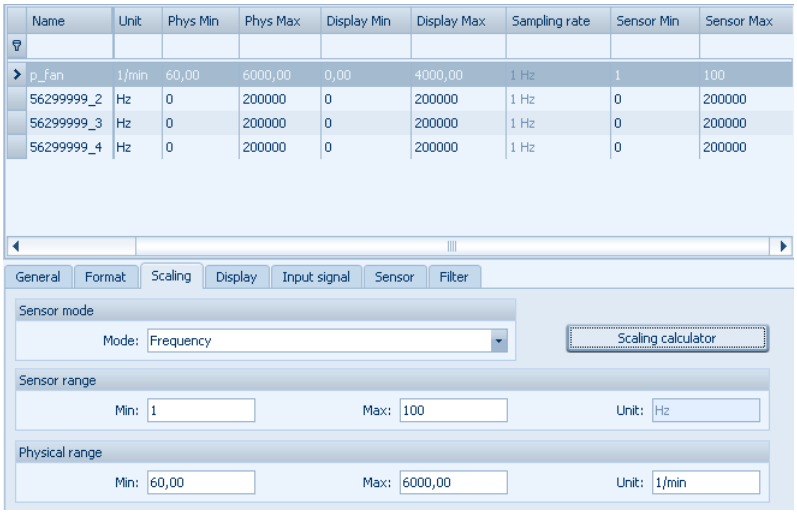
- Physical range: 60-6000 1/min
- Sensor range: 1 – 100 Hz

By using the **scaling calculator** and the Factor/Offset scaling you can alternatively define the values. Enter in the **Linear equation: y = m*x+b** the desired values for the factor and offset. Confirm your entries with **OK**.



5. In the **Display** tab a minimum of 0 and a maximum of 4000 was selected for the displaying range. Or directly enter the values in the channel overview using the columns **Display Min** and **Display Max**.

6. In the **Sensor** tab a sensor excitation of 15 V was selected.



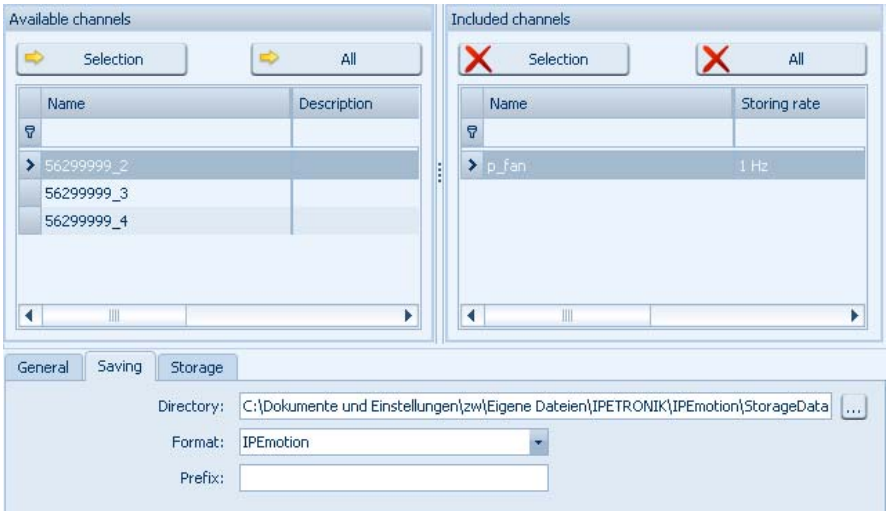
Click on **Save** to store the made changes and configurations in the current file. Or click on **Save as** to store the configuration using a different name.

7.4.2 Selecting storage group and channel

In the **Acquisition** main navigation tab all available channels are shown. To select the used channel for the acquisition proceed as follows:

1. Select the branch **Storage group-1** in the left tree view. All available channels are shown in the *Available channels* window. Select the desired channel and click **Selection** or drag the channels into the right overview *Included channels* by using the Drag&Drop function.

2. Using the **Saving** tab you can define the format and edit a prefix.



Click on **Save** to store the made changes and configurations in the current file.

7.4.3 Visually displaying acquisition values

The **View** main navigation tab offers you the ability to graphically display the defined channel. In our example the yt-chart is selected as visual element.

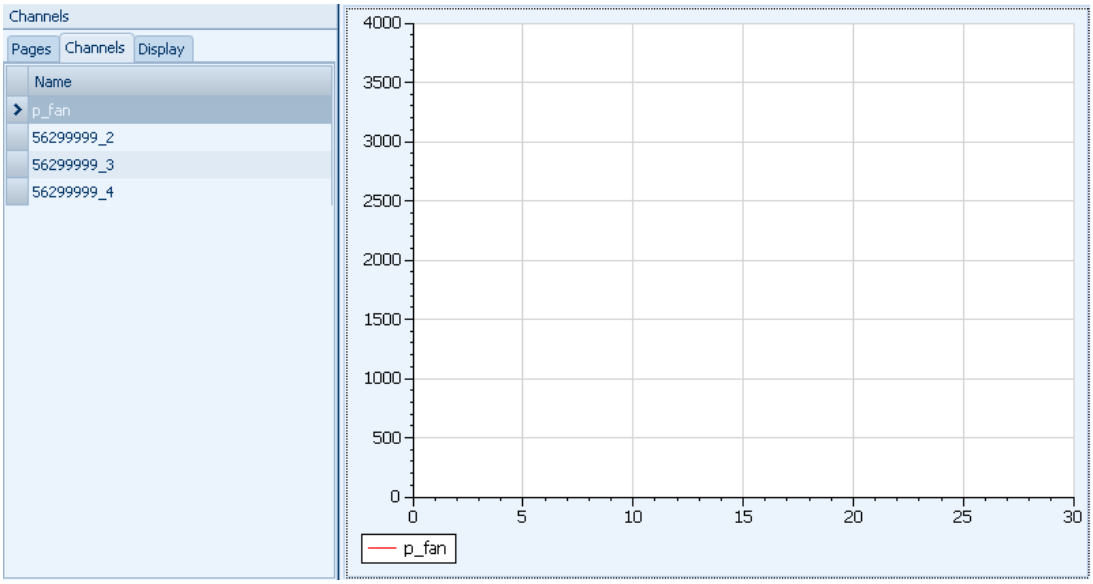
To display the desired channel and the respective data using a visual element, proceed as follows:

1. Select within the **Elements**

point the desired visual element.

2. Click on the button **Add page** . Change into the **Channels** tab and select the desired channel. Drag the selected channel into the right screen area by using the Drag&Drop function.

   The properties of the respective visual element can be defined by using the **Properties** button or by **double clicking** on the element.



3. Click on **Start displaying** . You can now read your momentary value from the respective visual element – but this value is not recorded and stored.

4. To record and save the data, click on **Start storing** . The acquired data is now stored in the application data. At using the standard installation the data can be found in: Windows XP: C:\Documents and Settings\xx\My Documents\IPETRONIK\IPEmotion; Windows 7: C:\Program Files\Common Files\IPETRONIK\IPEmotion\StorageData\. To stop the data displaying, click on **Stop displaying** .

Click on **Save** to store the made changes and configurations in the current file.

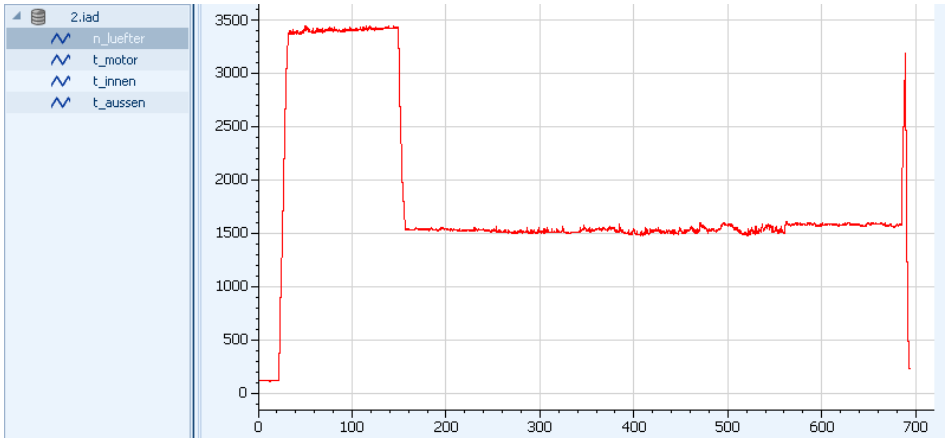
7.4.4 Managing the data

The **Data manager** main navigation tab offers you the ability to manage and analyze the acquired data and properties.

Open the desired dataset (*.iad file) with the **Load** button.

7.4.5 Displaying and analyzing data

The **Analysis** main navigation tab offers you the ability to visualize and analyze your data by using a y-t chart.



IPEmotion offers you the ability to visualize the single data in details by using the following zoom functions:

- Move – Move a single axis or both.
- Stretch/compress – Zoom in or out the displayed area of a diagram.
- Mark – Mark a specific area within the chart to enlarge this section of the diagram.

You can undo all zoom function and reset the displaying area to the original condition by using the button Original area.

Furthermore, you can use the following keyboard navigation for analyses:

▼/▲ - Change between the screen pages

Charts (Measuring cursor): →/← - Move the measuring cursor on the active graph by exactly one value; ▼/▲ - Move the active measuring cursor by 0.5 % of the x-axis range to the right/left; **Home/End** - Move the active measuring cursor to the point, which is the closest to the upper/lower limit of the x-axis range; **Tab** - Change the active measuring cursor

Charts (Zoom mode mouse): **+/-** - Zoom in/Zoom out the x-axis; **Shift** - Mode "Select"; **Shift +/-** - Zoom in/ Zoom out all y-axes; **Ctrl +/-** - Zoom in/Zoom out the active y-axis; **Shift** →/← - Move the x-axis by one axis scaling to the right/left; **Ctrl** →/← - Move the x-axis by the total length to the

right/left; **Shift** ↑/↓ - Move all y-axes by one axis scaling up/down; **Ctrl** ↑/↓ - Move the active y-axis by one axis scaling up/down; **Ctrl/Alt** - Mode "Stretch/Compress"

Video display (Progress slide control): →/←/↑/↓ - Change between the images within the video; ▼/▲ - Move back/forth within the video; **Home/End** - Change between the first/last image

7.5 Defining a triggered acquisition

The following example quickly shows how to run a triggered acquisition.

A trigger defines an activator for the start or stop of an acquisition depending on one or several signals.

In our example we decided for the following two acquisitions:

- Acquisition of the motor RPM with defined start- and stop-trigger
- Acquisition of the fan RPM with defined pre- and post-trigger and start- and stop-trigger

Therefore, two channels are selected and defined in the **Signals** main navigation tab.

- n_mot
- n_fan

By using the **Acquisition** main navigation tab you can configure the corresponding channels and the respective trigger.

1. First of all, add for each channel an additional storage group. Click on **Add storage group** .
2. Select the desired channel in the overview *Available channels* and click **Selection** or drag the channel into the right overview *Included channels* by using the Drag&Drop function.

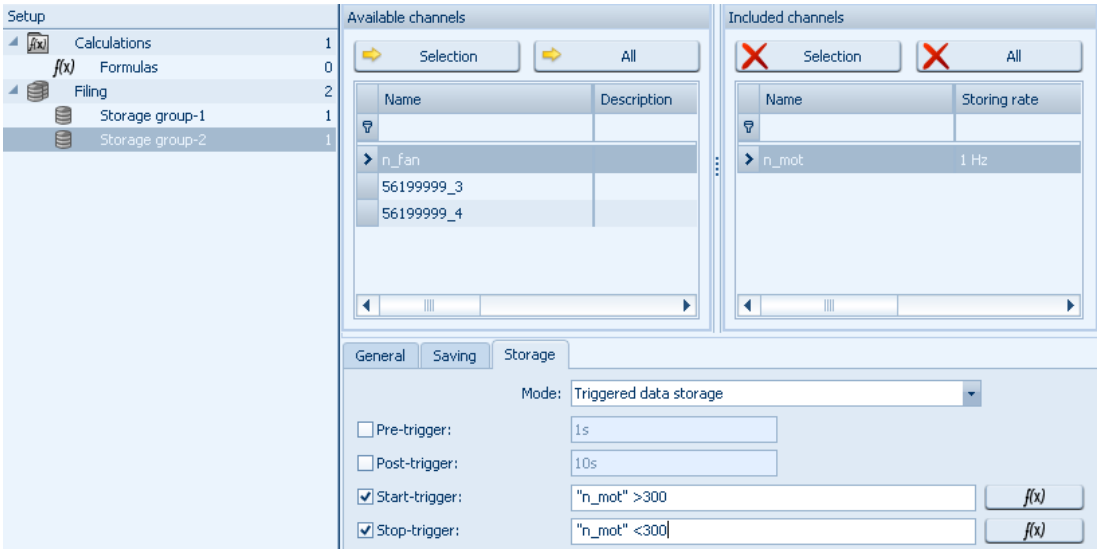
Using the **Saving** tab you can define the format and edit a prefix, e.g. Motor RPM or Fan RPM.

Using the **Storage** tab you can now define the trigger.

- n_mot:

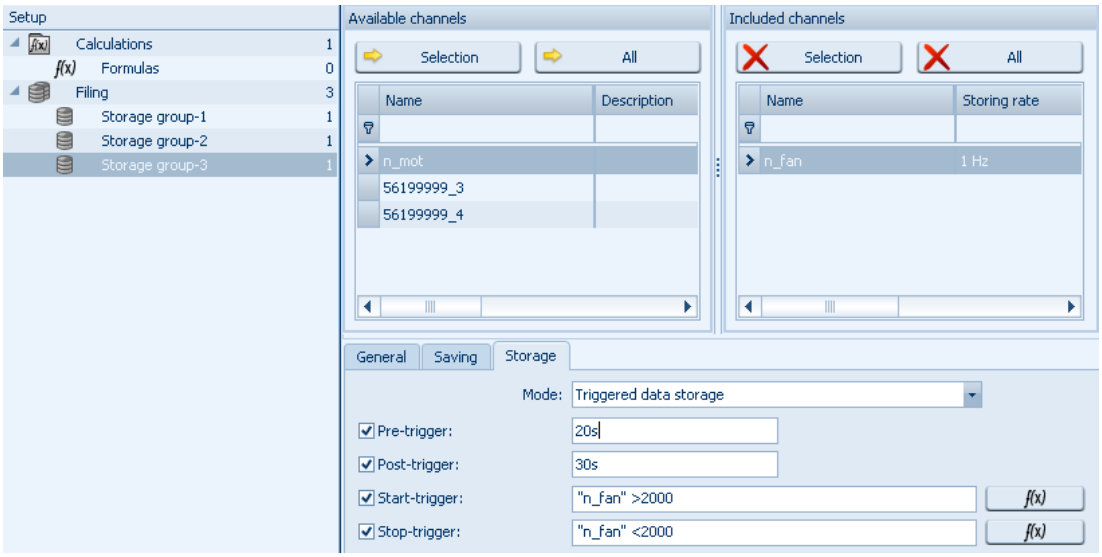
1. Select the **Triggered data storage** mode.
2. Define the **Start- and Stop-trigger** by using the Formula editor or directly enter the definition.

In our example the start-trigger is defined as "n_mot">300 and the stop-trigger as "n_mot"<300. It means that the data acquisition starts at the time when the motor RPM is over 300 1/min. Therefore, the data acquisition stops at the time when the RPM is under 300 1/min.



n_fan:

1. Select the **Triggered data storage** mode.
2. Define the **Pre- and Post-trigger**.
3. Define the **Start- and Stop-trigger** by using the Formula editor or directly enter the definition.



In our example the pre-trigger is set to 20s and the post-trigger is set to 30s. The start-trigger is defined with "n_fan">2000 and the stop-trigger with "n_fan"<2000. It means that the data storage starts at the time when the motor RPM is over 2000 1/min. Therefore, the data acquisition stops at the time when the RPM is under 2000 1/min. By defining a pre- and post-trigger you have a lead time of 20s and an after-run time of 30s.

Click on **Save** to store the made changes and configurations in the current file. Or click on **Save as** to store the configuration using a different name.

8 Software add-ons

8.1 Climate package

IPEmotion offers you the convenient ability to support various climate applications in the automotive and test bench sector. The functionality is based on a DLL developed by US authority NIST (software: REFPROP). This application executes the actual calculations.

A separate license is required for the use of this climate package. Besides this license a REFPROP installation is mandatory. If the climate license is activated, IPEmotion opens a “Open“ dialog at start to select the REFPROP-DLL. Without the refprop installation the climate package cannot be used and is deactivated. If IPEmotion without climate license is starting a configuration, which includes objects of the climate package (e.g. log p-h diagram, formulas), the objects are displayed but cannot be used.

The following refrigerants are currently supported:

Refrigerant	R134a	HFO-1234yf	R22	R404A	R410A	R507A	R744
Fluid index for calculation	1	2	3	4	5	6	7

8.1.1 Climate calculations

The calculations are provided by IPEmotion with climate package as external ones, which can be selected and configured within the formula editor. The refrigerant is defined by an index. These are values from 1 to 7 according to the above table of refrigerants.

Operator	Description	Syntax
h_std	Runs an enthalpy calculation based on refrigerant, temperature, and pressure. The temperature unit is °C and the pressure unit is bar.	h_std(Temperature channel; Pressure channel;Index of fluid)
h_liq	Runs an enthalpy calculation based on refrigerant, temperature, and pressure. This calculation can only be used for liquid or mixed measure points. The temperature unit is °C and the pressure unit is bar.	h_lig(Temperature channel; Pressure channel;Index of fluid)
h_vap	Runs an enthalpy calculation based on refrigerant, temperature, and pressure. This calculation can only be used for vapor measure points. The temperature unit is °C and the pressure unit is bar.	h_vap(Temperature channel; Pressure channel;Index of fluid)
T_sat_liq	Runs a calculation of the saturation temperature at the boiling line based on refrigerant and pressure. The temperature unit is °C and the pressure unit is bar.	T_sat_liq(Pressure channel;Index of fluid)

T_sat_vap	Runs a calculation of the saturation temperature at the dew line based on refrigerant and pressure. The pressure unit is bar.	T_sat_vap(Pressure channel;Index of fluid)
rho_std	Calculates the density based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The density unit is kg/m³.	roh_std(Temperature channel; Pressure channel;Index of fluid)
V_spec	Calculates the specific volume based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The specific volume unit is m³/kg.	V_spec(Temperature channel; Pressure channel;Index of fluid)
u_std	Calculates the specific internal energy based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The specific internal energy unit is kJ/kg.	u_std(Temperature channel; Pressure channel;Index of fluid)
s_std	Calculates the specific entropy based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The specific entropy unit is kJ/(kg*K).	s_std(Temperature channel; Pressure channel;Index of fluid)
c_vol	Calculates the isochoric heat capacity based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The isochoric heat capacity unit is kJ/(kg*K).	c_vol(Temperature channel; Pressure channel;Index of fluid)
c_pres	Calculates the isobaric heat capacity based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The isobaric heat capacity unit is kJ/(kg*K).	h_pres(Temperature channel; Pressure channel;Index of fluid)
subcooling	Calculates the subcooling (enthalpy difference) based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The enthalpy difference unit is kJ/kg.	subcooling(Temperature channel; Pressure channel;Index of fluid)
superheating	Calculates the superheating (enthalpy difference) based on temperature and pressure. The temperature unit is °C and the pressure unit is bar. The enthalpy difference unit is kJ/kg.	subcooling(Temperature channel; Pressure channel;Index of fluid)

Run climate calculations

The following chapter shows how to execute an enthalpy calculation based on fluid, temperature in °C and pressure in bar.

1. Select the **Acquisition** main navigation tab and the **Add calculation** function.
2. Open the **Formula** tab and the **Formula editor** and select the desired calculation instruction. Click OK to confirm the formula.
3. Change to the **View** main navigation tab and click on **Start displaying**. You can now read your momentary value from the respective visual element – but this value is not recorded and stored.

4. To record and save the data, click on **Start storing** . The acquired data is now stored in the application data. At using the standard installation the data can be found in: Windows XP: C:\Documents and Settings\xx\My Documents\IPETRONIK\IPEmotion; Windows 7: C:\Program Files\Common Files\IPETRONIK\IPEmotion\StorageData\. To stop the data displaying, click on **Stop displaying** .

8.1.2 Log p-h diagram online (View)

The log p-h diagram is used for visualizing refrigeration processes and plots the values Pressure (p) and Specific Enthalpy (h) against each other. Any channels, formulas, and variables can be added to the visual element – but no spectra. Please find the following most important features of the visual element in clear list:

- Complete configuration via graphical user interface
- Only one refrigeration process can be displayed per instrument
- Configuration of a reference graph
- Configuration of background graphs
- Support of various refrigerants with .fld and .ppf extensions that are provided by REFPROP

Use the log p-h diagram

The following chapter shows how to configure and use a log p-h diagram for visually displaying measure points:

The **View** main navigation tab offers the ability to graphically display the value.

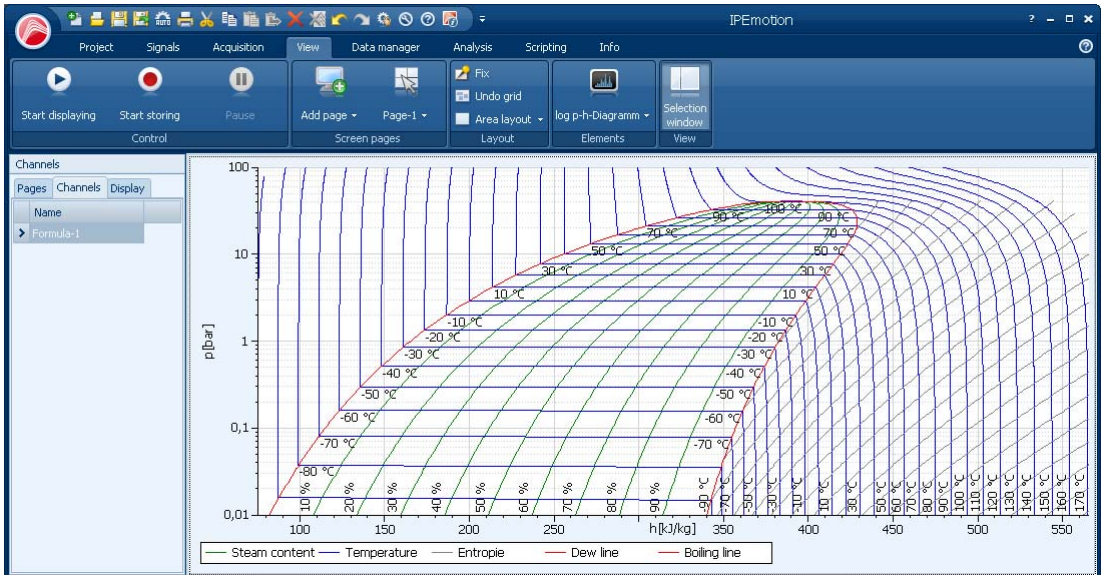
1. Select the **Elements** section in the main navigation tab **View** and the **log-p-h diagram**. The properties of the visual element can be defined with the context menu of the right mouse button or a **double click** onto the element.

2. Select the desired refrigerant within **Properties** → **General**.

3. Configure the circuit and define any number of measure points. The enthalpy and pressure channels can be added to the chart in turn (see chapters Run climate calculations, Add channels).

4. Click on **Start displaying** to display the current circuit status. You can now read your momentary value from the respective visual element – but this value is not recorded and stored.

5. To record and save the data, click on **Start storing** . The acquired data is now stored in the application data. At using the standard installation the data can be found in: Windows XP: C:\Documents and Settings\xx\My Documents\IPETRONIK\IPEmotion; Windows 7: C:\Program Files\Common Files\IPETRONIK\IPEmotion\StorageData\. To stop the data displaying, click on **Stop displaying** .



The diagram is displayed with the tree structure. The *Display* tab shows the diagram at the highest level and the subordinated signals.

The log p-h diagram has only one x-/y-axis. The axis description and the corresponding units are shown by default. The enthalpy unit is fixed and cannot be changed. The pressure unit of the y-axis can be defined by the user. The units used for displaying can be defined with IPEmotion **Options -> Units**.

The following background graphs are shown by default: Dew/Boiling line, Steam content line, Isotherms (pressure/enthalpy pattern at constant entropy), Isotropic (pressure/enthalpy pattern at constant temperature). The displaying properties can be defined and saved with the configuration dialog.

Add channels

Every log-p-h-diagram supports any number of signals whereas every signal includes 2 channels (enthalpy and pressure channel), which have to be defined. Channels can only be added to the chart one by one. An acquisition can also be started if the diagram contains an uneven number of channels but the incomplete signal is not displayed in the diagram. The first added channel is interpreted as enthalpy channel, the second as pressure channel if the channel no units. If the channels can be identified as pressure or enthalpy channel, they are added to the acquisition point. A new signal is only generated if all available signals are completely configured (pressure and enthalpy channel available). A channel can be used several times in a diagram but the channel combination can only be created once in a diagram. There are the following possibilities to assign channels:

- in the View tab:
  - Drag the channel into the visual element.
  - Open the context menu with the right mouse button and select “Add channel”.
  - Open the context menu with the right mouse button and select “Copy” (Ctrl+C), select the visual element, “Paste” (Ctrl+V).

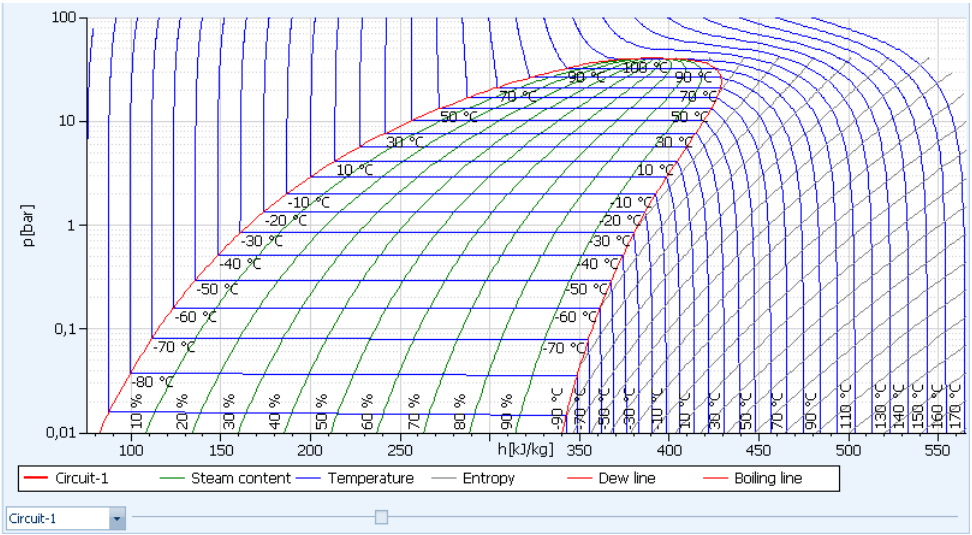
8.1.3 Log p-h diagram offline (Analysis)

IPEmotion V01.09.00 offers you the ability to use a log p-h diagram based on the REFPROP climate package within the analysis. The diagram essentially includes the same configuration functionality like the diagram in the view tab (online). Please find in the following the most important differences and updates:

- Support of several circuits
- Slide control/cursor for displaying the circuits at any time
- Support of Replay functionality

The diagram allows to display refrigerant circuit data offline and analyze the data. The standard diagram includes in the lower area a selection possibility of the desired circuit and a slide control to display any time.

The desired circuit can also be selected within the configuration dialog in the *Circuit* section.



Add channels

You can add enthalpy and pressure channels correspondingly to the process in the log p-h diagram online. Enthalpy channels can be created in the main navigation tab *Acquisition* with a formula and following storage (see chapter Run climate calculations). Channels can additionally be added with creating a suitable offline formula.

Context menu

The following overview shows all additional options of the context menu, as well as, all options with changed functionality:

Add channel	Shows a channel list for adding to the visual element. Several channels scan be selected. This function always refers to the selected circuit.

Delete measurement point	This option is only active if the diagram contains channels. This function always refers to the selected circuit.
Add circuit	Adds a new and empty circuit and selects it.
Delete circuit	Deletes a circuit. The circuit is selected with a list containing all available circuits.

Keyboard control

The log p-h diagram (offline) allows to control the slide control with the keyboard.

Increase time value	Arrow up, Arrow right
Decrease time value	Arrow down, Arrow left
Start time	Home
End time	End

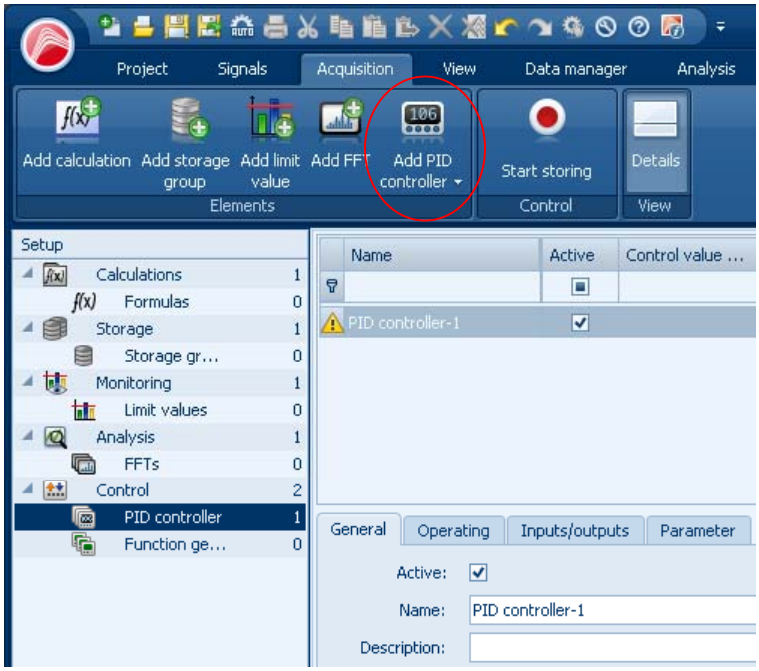
8.2 Control

8.2.1 PID controller

PID controller objects in IPEmotion allow reproduction of real PID controller functionality. This includes the use of any numeric channels as actual value, nominal value, and control value. Variables like amplification factor (Kr), lead time (Tv), and follow-up time (Tn) can be defined as constants. The activation of the expert mode (see *Options -> Basic settings*) allows using these variables as internal channels, which can be changed during running acquisitions.

Use PID controllers

The **Acquisition** main navigation tab shows the PID controller function within the tree structure of the setup area **Control**.



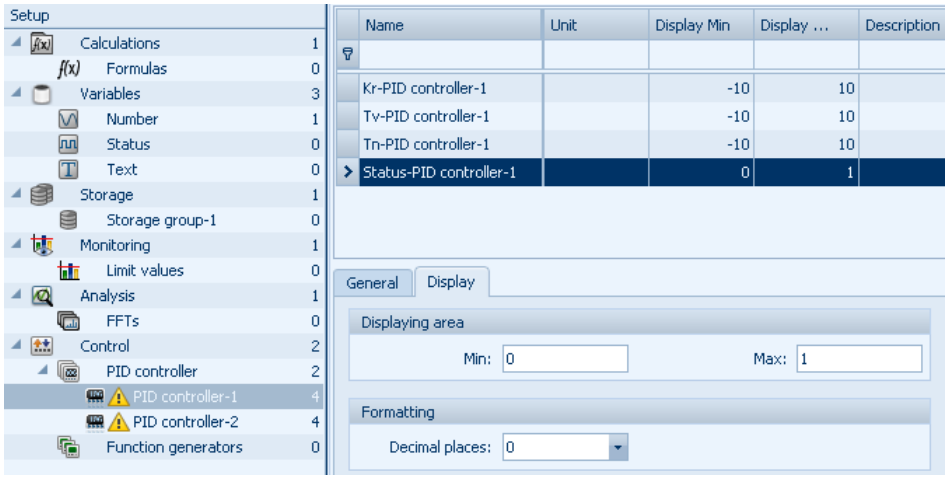
Select the **PID controller** function and expand your configuration by a controller with the **Add PID controller** button or the **context menu** of the right mouse button. Afterwards all configured controllers are listed. Each controller can be defined with the grid columns or the tabs. Further grid columns are available with the *Column Chooser* function.

The PID controller offers a start-, stop-, and hold-trigger (see **Operating** tab), which can be activated / deactivated independently of each other and defined with any formula of the IPETRONIK formula editor.

Use the **Inputs/outputs** tab to define the control value, actual and nominal value. The values calculated by the PID controller are output on an IPEmotion channel. This (control) value channel has to have an output functionality and must be a numerical value channel.

Kr, Tv, and Tn within the **Parameter** tab configure the behavior of the controller. These parameters are additionally displayed as internal channels at activated expert mode if the controller is selected in the Setup tree.

Furthermore, status channels can be used, which e.g. show the triggering status.



Each of this 4 internal channels can be defined with the grid columns or the tabs. Further grid columns are available with the *Column Chooser* function.

8.2.2 Function generators

Function generator objects in IPEmotion allow reproduction of real functionality of function generators.

As well as with real function generators, it is possible to generate different types of signal forms whose parameters can also be changed. Every signal form has a function generator object. That means that the user already decides which signal form should be used at creating the function generator. The current version offers the following types of function generators:

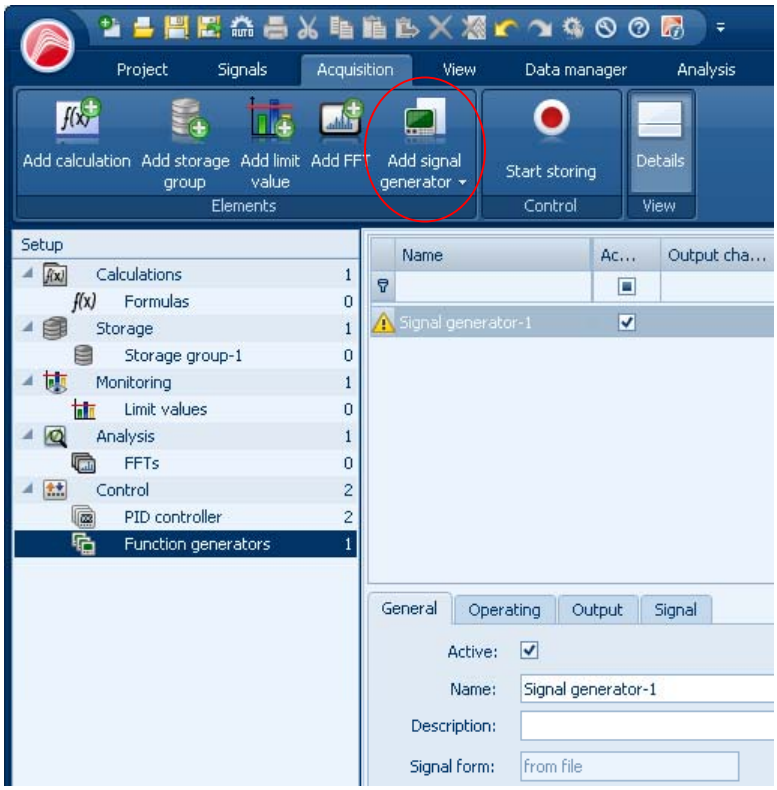
- Sine
- Sawtooth
- Rectangle
- Ramp
- from file

The *from file* signal form can output any signal course. This file must be a measurement file supported by IPEmotion from which the first channel is used. If more than one channel is included, an info message is output.

Depending on the function generator type, variables like frequency, offset, and amplitude can be defined as constants. The activation of the expert mode (see *Options -> Basic settings*) allows using these variables as internal channels, which can be changed during running acquisitions.

Use function generators

The **Acquisition** main navigation tab shows the function generators within the tree structure of the setup area **Control**.



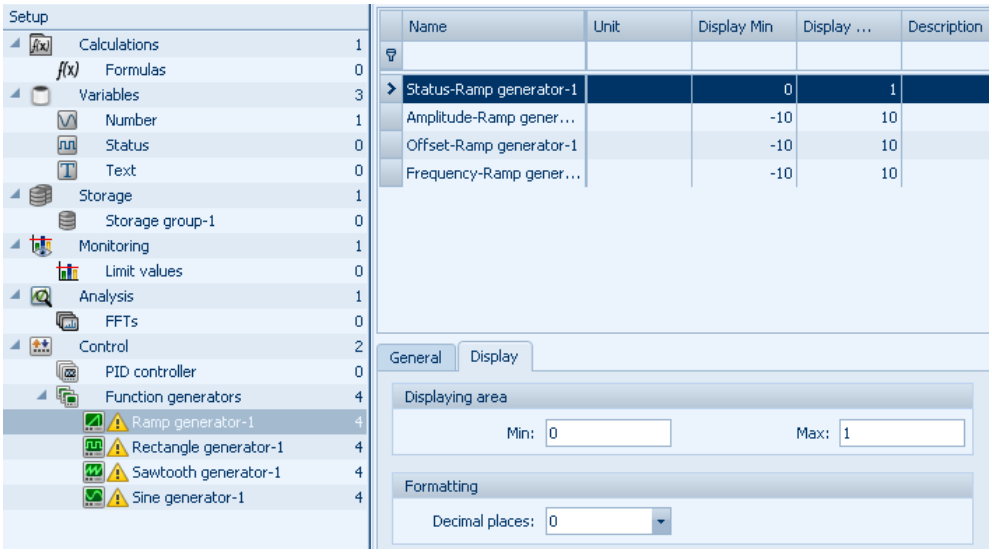
Select the **Function generators** and expand your configuration by a generator with the **Add signal generator** button or the **context menu** of the right mouse button. Afterwards all configured generators are listed. Each generator can be defined with the grid columns or the tabs. Further grid columns are available with the *Column Chooser* function.

The function generator runs in continuous operation by default, i.e. there are no cycles/triggers to be considered. But a reasonable use with test bench applications requires triggers. The latest version offers a start-, stop-, and hold-trigger (see **Operating** tab), which can be activated / deactivated independently of each other and defined with any formula of the IPETRONIK formula editor. Use the *Cycles* parameter to define a specific number of cycles for the function generator.

The values calculated by the function generator are output on an IPEmotion channel (see **Output** tab). This channel has to have an output functionality and must be a numerical value channel.

Use the **Signal** tab to define the working and signal frequency, offset and amplitude depending on the function generator type. Please note that the signal frequency must be maximum the working frequency/2. You can also manually define a signal frequency < 1 Hz. Otherwise an error message is output and the values are not transferred. The working frequency may be greater than the channel frequency but a warning message appears at exceeding.

The expert mode allows you to change amplitude, offset, and frequency during a running acquisition by addressing the respective internal channels. Furthermore, status channels can be used, which e.g. show the triggering status.



Each of this 4 internal channels can be defined with the grid columns or the tabs. Further grid columns are available with the *Column Chooser* function.

9 External IPEmotion automation interface

The IPEmotion automation interface meets the criteria to expand and open up a wide range of application for IPEmotion. It offers users with advanced programming knowledge the possibility to amend the functionality of the IPEmotion software and to embed your own applications into IPEmotion and vice versa.

The advantage for the user is the ability for optimization of working and distribution processes. As an example, the automation of measuring sequences can be mentioned. With the help of the IPEmotion automation interface simplified proceedings are provided, thus reducing and minimizing the use of time.

The external IPEmotion automation interface (out-of-process) provides the complete remote controlling of IPEmotion and is considered an **object-oriented programming interfaces**. It uses interface indicators and is therefore more flexible than the function-oriented programming interfaces.

Furthermore, the external automation interface contains an interface description in the form of a type database for the access to the available functions, data structures and sub programs of IPEmotion. You can find further information and a detailed description of the IPEmotion COM automation interface in the documentation IPEmotionCOM.chm.

Please note that a CHM editor is required for opening the CHM file under Windows Vista.

9.1 Advices for the IPEmotion editions

The **external IPEmotion automation interface** is an **optional software component** and is with the **Developer** edition included in delivery.

With the **Developer** edition you have additionally the ability to create **runtime** versions. For more information about runtime versions please consult chapter 8.2.

The external IPEmotion automation interface is based on the implementation of **COM components** (***C****omponent* ***O****bject* ***M****odel*). You can create inter-process communication and dynamic object generation under the platform Windows. With the use of the COM interface, IPEmotion offers you the ability to program

- language independent
- version independent
- object-oriented

Each COM component offers an interface that can be used after successful instantiation (creating an object of a specific class) for using the available functions of the COM component.

With the help of the out-of-process interface you can address and control IPEmotion from an external program. The out-of-process interface in IPEmotion is designed to be used with **any programming language**. Automate for example the following sequence: Start program, load configuration, start and stop storing.

The following example shows the code of a Visual Basic .NET application for an acquisition and storage of data.

Example code:

```
Dim app As IPETRONIK.IPEmotion
app = CreateObject("IPETRONIK.IPEmotion")
app.OpenWorkspace("C:\Test.iwf")
' Acquisition with storage of the measured data
app.AcquisitionWorkspace.StartAcquisition(IPETRONIK.AcquisitionModes.ACQUISITION_MODE_STORAGE)
app.AcquisitionWorkspace.StopAcquisition()
app.Quit()                                          ' Closes IPEmotion
```

9.2 Creating runtime versions

A runtime version is a user-defined software version, which cannot be changed and which is protected against access by the end user.

For creating IPEmotion runtime versions you need the Developer edition. With this IPEmotion runtime version you have the ability to individually personalize graphical user interfaces. The menu structure including the ribbon can partly or completely be locked.

During creation of a runtime version, a file with .irc extension is generated. This file can also be used with the basic version of IPEmotion after having filed it in the program folder (e.g. C:\Program Files\IPETRONIK\IPEmotion Vxx.xx.xx\Runtime.irc). Please note that this configuration cannot be modified.

You can create, as many runtime versions as, you want. All configuration data, as well as, all macros and scripts, which have been created using the internal or external automation interface are firmly linked to the IPEmotion software.

10 IPEmotion PlugIn

IPEmotion is a software for acquiring, managing, and analyzing data. The signals are generally acquired by using external acquisition systems. For using any acquisition devices IPEmotion offers a standardized interface. This interface is called PlugIn.

A plugin interface is a component, which is generally made of several DLL files (Dynamic Link Libraries), as well as, description files in XML format.

To allow a complete configuration and use of acquisition devices in IPEmotion, the following three main components are available:

- C++-DLL for hardware access (Acquisition interface)
- NET-assembly for the configuration (Configuration interface)
- Device description files in XML format

The device description files are divided as follows:

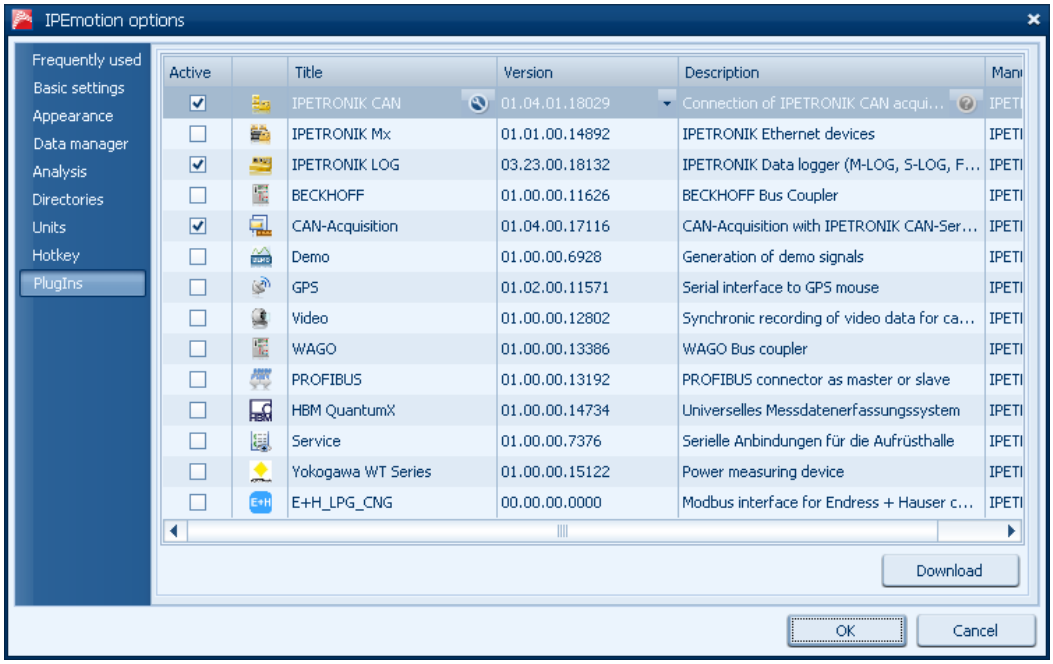
- Name.IMD (IPEMOTION PlugIn Description)
- *.IMT (IPEmotion PlugIn Templates)
- *.IMT (IPEmotion User Interface Templates)

Depending on the complexity of the used devices and depending on the connection, not all components are always necessary. A .NET-assembly for instance is only needed if a description of the parameter and their dependencies cannot completely be defined by using the IPEmotion description files.

A plugin is installed with the IPEmotion setup as MSI files. But it can also be installed at any time by using an own setup program.

IPEmotion detects every installed plugin at start. To select the desired systems use the IPEmotion user interface and the **Options → PlugIns** function.

Please note that only activated hardware systems can be configured in IPEmotion!



Confirm your selection and close the IPEmotion Options dialog with **OK**.

10.1 PlugIn-Designer

The plugin concept is based on the Open-Source principle, i.e. you have the ability to develop and exchange an own plugin by using the free English software PlugIn-Designer. Important plugin processes are certified by IPETRONIK. With this certification the plugin is integrated into the standard distributions and support and maintenance.

For developing a plugin IPEmotion offers you this PlugIn-Designer, which is stored in the following directory: C:\Programs\IPETRONIK\IPEmotion. You have the ability to create the needed description files by using WYSIWYG. In addition, the PlugIn-Designer generates a code frame for Microsoft Visual Studio 2005 and higher, which already converts all information of the description files into source code. The creation of a documentation in a XML file is also included. Therefore, the programming can be reduced to a minimum.

Please find further information and descriptions on how to create a plugin and use the PlugIn-Designer in the respective plugin documentation.